Editorial

MORE than once in the last few weeks I have seen opinions expressed in the Press and elsewhere that man is finding out things he is not meant to know, that dreadful consequences will follow his acquistion of new knowledge, and that scientists should be prevented from meddling with things which might annihilate the physical and moral well-being of the world.

These opinions have been expressed as comment on such things as the development of the H-bomb as this new source of energy is so unhappily known, and others in various fields.

How familiar would this viewpoint sound in the ears of our forefathers!

In a way, we can understand, even with amusement, the reaction of those who thought the steam engine and the motor car to be inventions of the devil. But when we come to other matters, which threaten to shine new light on many fixed ideas and ideals, we find the antagonism to change and new knowledge very much deeper in its roots.

The history of man's thought shows very clearly that, until recent times, the inter-relation of mind and matter was scarcely suspected by the average man, who, in thousands, of simple examples, went to great pains to produce fantastic explanations—or excuses—to avoid facing the implications of advancing thought, and the revelation of new truths. And yet, while men were holding hot and ignorant argument why the earth should be flat, and not round, others were already so far ahead that they were ruminating on the possible relationship between space and time.

As I pointed out last week, Einstein, whose clear mind is legendary, has shown even to those who can only see dimly, the inescapable conclusion that far from having comfortably encompassed the divisons between mind and matter, we are in reality merely sitting on the rim of a new universe of thought from which we have evolved.

I share the apprehension that humanity in the mass is not yet capable of using its new vision and achievement, but on the contrary will proceed not only to destroy itself, but the achievement as well. Unfortunately, while we can keep fire from the hands of children, we cannot apply the same measures to grown men. Any attempt to do so would not only be utterly indefensible, but utterly hopeless.

We cannot do more than spend our energies in our own education and enlightenment—in fact we have no alternative. If there should be one, it may well prove sooner or later, to be utter destruction.

John Moyle

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RADIO AND HOBBIES IN AUSTRALIA

A NATIONAL MAGAZINE OF RADIO, HOBBIES AND POPULAR SCIENCE

EDITOR
JOHN MOYLE
S.M.I.R.E. (AUST.)

TECHNICAL EDITOR
NEVILLE WLLIAMS
A.M.I.R.E. (AUST.)

TECHNICAL STAFF
RAYMOND HOWE
MAURICE FINDLAY
DERRICK WILLIAMSON

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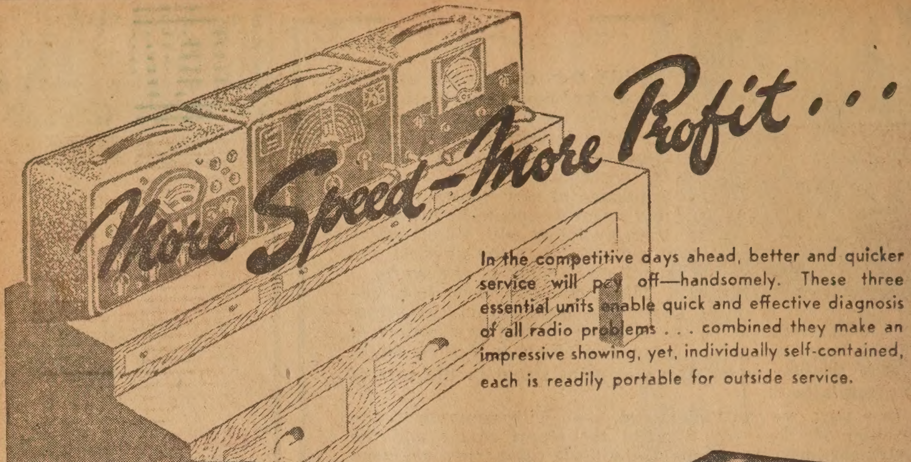

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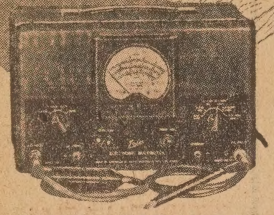

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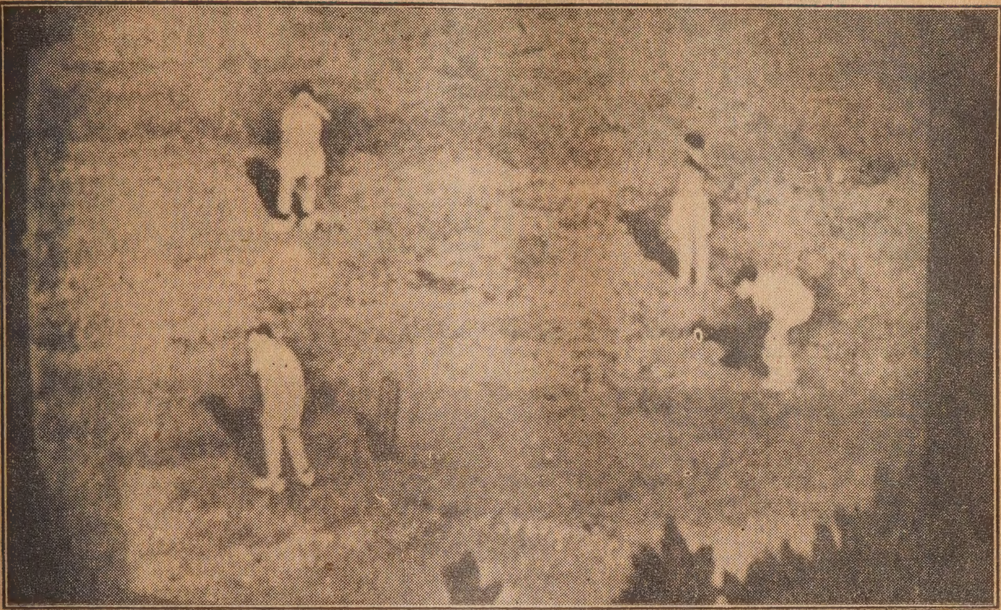
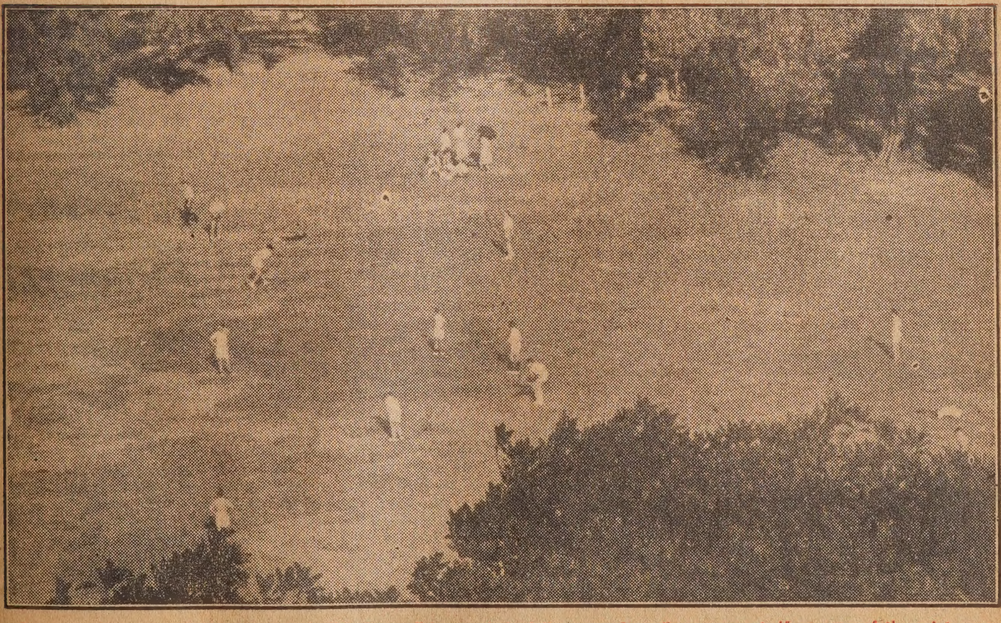
SAMPLE OF 625 LINE TELEVISION

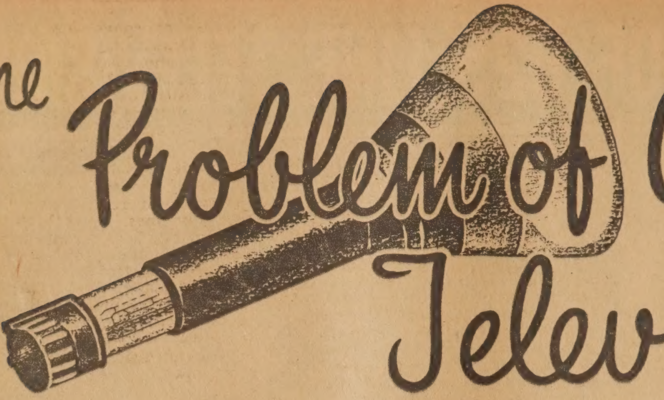


During some recent television tests made by AWA engineers, the television camera was trained on a cricket match from a distance of 350 yards. The above picture taken by one of our photographers shows the 625 line image to possess remarkable long distance definition due to the sensitivity of the Image Orthicon camera. The ball was visible but could not be seen at that distance with the naked eye. It must be remembered that the players were in motion at the time, and effective definition was much better than in the photograph. Exposure 1/25 second at F 3.5



In comparison our photographer took this long distance shot of the game from the same spot. If an area of the print were to be enlarged equal to that shown on the vision screen, its definition would be very little better. Most televising takes place under more favorable conditions. The time was 5pm.

The Problem of Color Television



As one of radio's pioneers, Dr. Lee de Forest is a man whose opinions must be heard with respect when he discusses modern radio trends. His comments on color television in USA, published by special arrangement with "Radio-Electronics," are particularly pertinent in view of the present reconsideration by the Australian Government of our television plans.

COLOR television, as an idea and aspiration, is almost as old as mechanical television itself. That grand old TV pioneer, John Logie Baird, demonstrated in England a crude form as early as 1928. He employed, of course, the whirling disc with two color filters, one red and the other a combination of green and blue colors.

A year later Dr. Herbert E. Ives, of the Bell Telephone Laboratory, also using a perforated disc, demonstrated a somewhat similar color television system.

In 1931, a German engineer, Ahronheim, devised a color system using a 12-color filter disc in conjunction with a scanning disc.

In February, 1930, a patent on color television was issued to Ray D. Kell, assigned to the General Electric Co. It also employed a double, spiral scanning disc and only two colors instead of all three primaries.

In the early thirties, the electron beam swept all such mechanical devices into the discard, and would-be TV colorists began to devise ways and means for tinting monotonous monochrome kinescope pictures with all the hues and shadings of the rainbow.

COLOR

Until today, the question paramount in the minds of all television-minded citizens, owners (or prospective owners) of kinescope sets, is COLOR. How soon will color TV be available and at what retail cost? Opinions differ widely. CBS is vociferous in its claims that it has thoroughly demonstrated the merits of its mechanical, sequential, subtractive color system; and a dozen TV-set or gadget manufacturers announce their readiness to supply the public with motor-driven tricolor discs at low prices for CBS-type polychrome reception.

RCA has recently given some remarkable demonstrations of its all-electronic color system before the FCC and selected guests. The writer has witnessed these and has gone on record as saying that in fidelity of colors of every hue and shade when seen on direct-view screens, it leaves nothing to the imagination. Projected images, however, lack as yet, desirable brilliance.

THREE PICKUPS

The system of Color Television Inc., of San Francisco, like that of RCA, uses three separate pickup devices, all in a single camera, combining at the receiver the color images by optical projection from three separate cathode-ray tubes with different phosphors, red, green and blue.

All three of the above color systems now operate within the 6-mc band, as required last year by the Federal Communications Commission, so all are applicable to our existing v.h.f. television channels. In the 1946 demonstrations, both CBS and RCA systems required bands of 12-mc or more, thereby restricting their proposed operations to the u.h.f. channels not yet authorised by FCC.

Both organisations now claim that their present 6-mc-band-width pictures are essentially as satisfactory as those demonstrated in 1946. This has been questioned. In view of the fact that the widespread successful commercial employment of the proposed u.h.f. channels has not yet been proven (and in the minds of many experts, will never be satisfactory in many localities and during certain and seasonal weather conditions), the wisdom of FCC in stipulating that color must fit existing v.h.f. channels is clear and is generally approved.

The Radio Manufacturers' Association has recently laid down requirements for any future acceptable color television system; these are carefully thought out, clearly logical, and designed for the greatest benefit to the television industry, and the public now and in the future.

Foremost of their sine qua non conditions, a positive must, is that of compatibility. This simply means that whatever system of color is finally to receive the green light from FCC must be one whose color telecasts can be received on any existing standard black and white receiver, and must be equal in quality to any monochrome TV picture today.

Any color system that cannot comply with this fundamental requirement should not be authorised. If the introduction of color telecasting means that any number of today's 3,000,000 TV receivers cannot receive a particular programme (in monochrome), the television viewing audience will be reduced by just that number of receivers.

The potential prosperity of the television industry, broadcasters and set manufacturers alike, demands that the television audience be built up as fast as possible. We cannot wisely permit anything which will compel any fraction of the existing audience to switch off their sets.

PROGRAMMES

Only the inferior quality of a programme's content itself should induce a viewer to turn to some other channel. He should not be forced to do so by the technical limitations of his present TV set. Any other policy will spell disaster to this growing industry.

We cannot afford, in the interests of a small favored minority who can afford to purchase converters for color, to penalise others less favored, or to reduce the number of available programmes for that vast majority who, for one cause or another, are not equipped for color viewing.

The logic of this position of RMA

is unassailable. I think I can speak authoritatively on this topic. For the past two years I have been quietly at work on a mechanical television system, requiring no color wheel which limits the service as does the CBS system to seven or ten-inch kinescopes. In place of the outlandishly large color wheel and the requirement of circuit changes to provide a frame frequency of 144 (instead of 30) per second and a reduced number of lines, I place before any kinescope face, even of 16-inch diameter, a three-color mosaic screen. It oscillates in an orbital, circular movement less than one inch in diameter, 30 times per second, so that each picture element is viewed through one of the three prime colors on the mosaic filter screen every 1-30th second.

COLOR ADAPTOR

Nothing could be more simple or cost less than such a color adapter, readily slid in front of the kinescope face for color viewing and withdrawn for monochrome programmes. The mosaic shuttle must, of course, oscillate or circulate in synchronism with a similar one properly located in the light beam from the image to the pickup camera (flying-spot or image-dissector type). This requirement is readily met; the small driving motors are of only 10 watts power.

But this system, like the mechanical system of CBS, was not, at the time of the FCC hearings, compatible. Used with a black and white receiver tuned to the color transmission, a rapidly shifting veil or pattern appeared, superimposed over the monochrome picture from the color transmitter.

This has since been eliminated by a device which is quite simple, whereby the image may be seen on a black and white kinescope, like any present monochrome-transmitted picture.

Therefore, it was not submitted, in the form it had at that time, to the Federal Communications Commission at the recent color television hearings in Washington.

POLITICS

It is highly regrettable that politics has pushed its ugly head into the color-television picture; nor is it too difficult to imagine just why certain solons have taken it upon themselves to attempt to force FCC into a premature, ill-considered decision authorising any particular existing color TV system for early commercial introduction and exploitation. (As logically should the Western Union seek a ruling by FCC that only thet new zirconium spotlight, admittedly superior, should be used as the accepted illuminant in all television studios!)

Color television should not be *forced* upon the industry, nor on the public. As is admitted by all proponents of this or that color system (with one single exception), the fruit is not yet ripe on the tree of knowledge. Let us have more time to perfect this highly complex facility—to iron out a mess of wrinkles and imperfections.

The industry has only now struck its stride. Much of it is yet deeply in the red, financially. We need at least three years more of growth and unimpeded prosperity while the wizards of electrons and circuitry are dressing up their polychrome babies.

I think no fixed time for color-system acceptance should now be placed on any calendar. Let us wait until black-and-white market saturation has been reached. Then will be the proper time to introduce to an eager, accepting audience of at least 5,000,000 set owners an RMA-standardised color television system—one which is absolutely compatible and one which will not reduce the viewing audience by a single set, nor by a single hour of employment or enjoyment. Also the color-television receiver should cost little more than the better class of monochrome sets, or color converters should be available at the very minimum of expense. Then, and not until then, let us have color television.

One thing is clear: no color adapter should be limited to 7- or 10-inch kinescopes, nor to projection types of receivers. For the past year the trend has been increasingly toward the larger direct-view sets, 12-, 16-, 19-inch kinescopes.

SMALL TUBES

Any color system limited to smaller tubes or to dim projected images should not be considered, for obviously they will have scant public acceptance. Owners of the larger sets must not be debarred from color nor compelled to buy completely new receivers for color television enjoyment.

Such logical considerations will render abortive the high-pressure methods now so evident, seeking to force a half-sized or midget color system upon industry and public. The simple fact that a certain system "is operative today" by no means rules out the obvious fact that some other color system may be operative in a far better fashion two or three or four years or more from now.

by Dr. Lee de Forest

Delay in immediate acceptance of any system today would, we are told, "result in a double loss for the public, because millions more of black-and-white receivers lacking provision for adaption and conversion will have been purchased."

But why increase the cost of our present chassis and cabinets for the purpose of converting to any one system which may, probably will, be obsolete and discarded within the next three years? Public loss will be safeguarded by watchful waiting—not by jumping into a 10-inch bag be it ever so colorful.

More rather than less emphasis should be placed on compatibility, as month by month more hundred-thousands of receivers roll off the assembly lines. Did I not sincerely believe this, I would be emphatically advocating the advantages of my own color system over all others in evidence today. But RCA, at least, has proven the practicability of compatibility. Let other aspirants do the same. We want no brake applied to the television chariot, today, or tomorrow.

COMPATABILITY

Color television in 6 mc must proceed upon a lasting foundation of proper standards, excellent performance, and complete compatibility with existing receivers, *with no changes in their chassis for black-and-white reception of color programmes.*

The RCA color system is a triumph of clever electronic engineering. (It is described elsewhere in this issue. —*Editor*). At present, however, RCA color receivers are too costly compared to monochrome, and their converters are scarcely less so. The engineers are hard at work to simplify and cheapen these devices, and it is reasonable to expect revolutionary improvements and drastic cost cuts during the next two years. Other systems may do the same, or better. By all means, then, let us control our natural impatience to view color perfection on our screens. Delay today will pay rich dividends, in color and costs, tomorrow, or possibly day after tomorrow.

And in the meantime, let the FCC at once lift its arbitrary "freeze" on further extension of vhf video transmitters, so that every section of the country may enjoy as rapidly as possible the immeasurable benefits of television reception. The duty of the Commission to act speedily in this is incomparably more imperative than to decree that color television should be quickly commercialised.

ARTIFICIAL sapphires can now be made into lenses for microscopes and cameras, and it is expected that these jewel lenses will be of particular use in correcting optics for color transmission.

It was reported to the Optical Society of America that a lens of one-inch focal length and f/1.5 has been constructed with two sapphire elements.

Sapphire of acceptable optical quality has been manufactured in sizes up to 20 millimeters diameter. Methods of polishing this material which is harder than glass have been worked out.

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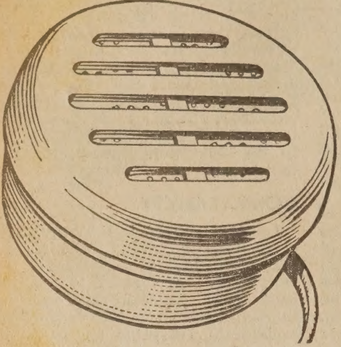

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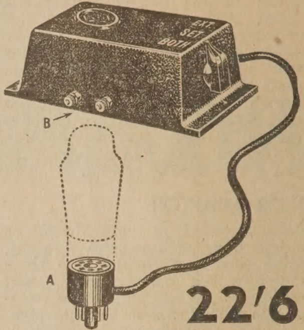

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Both "Pillo-Fone" and extension speaker can be operated satisfactorily by connecting across voice coil of existing speaker, but if it is desired to use either separately the control unit is required.

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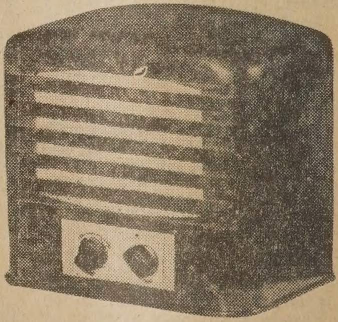

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THE HISTORY OF ELECTRICITY—9

More than any material monument could ever do, that universal designation of the simple unit of electrical pressure or potential, to wit, the volt, has enshrined in perpetuity the memory of Alessandro Volta, the Italian physics professor, who first discovered the electric current towards the end of the eighteenth century.

VOLTA'S lasting fame and celebrity is a deserved one, for it was he who, through the "invention" of the electric current, made the first really practical stride towards the day-by-day utilisation of electrical energy which we see around us in modern times. It was, indeed, this pioneering discovery of Alessandro Volta which paved the way for the host of important electrical discoveries and applications which came after him.

The epoch-making discovery of the electric current was intimately bound up with the "frog's legs" business of Volta's countryman and contemporary professor Dr. Luigi Galvani, whose life-story formed the theme of our last article of this series.

Galvani, it will be remembered, had nailed his colors to the mast of "animal electricity," and perhaps because of that he had died a disappointed man. He had maintained that the convulsive twitchings of frogs' legs, when dissected and touched at certain points with metallic conductors, were due to inherent electrical charges *within* the animal muscles.

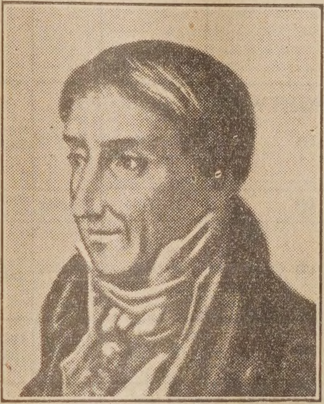
Volta showed that such a hypothesis was simply not true, and because Volta, at that time, was professor of Physics in the University of Pavia, and, so to speak, Galvani's "opposite number" in the Italian academic world, a controversy arose which at one period seemed to rock the very fundamental of science.

ELECTRICITY FROM DISSIMILAR METALS

It was because Volta had been able to demonstrate the fact that the characteristic twitchings of the dissected legs of frogs were due to the influence of two dissimilar metals in the presence of moisture and traces of mineral salts derived from the flesh and muscles of the amphibians that the same investigator was led to experiment with the effect of salt solutions on dissimilar metals, and, as a result not only finally and conclusively to confute Galvani's theorems, but, more important still, to introduce to the world for the first time a controllable means of generating a continuous flow of electricity—in other words, an electric current.

Alessandro Guiseppe Volta was born at Como, Northern Italy, on February 18th 1745, the year of the "Bonny Prince Charlie" uprisings and their ruthless suppression in England.

Alessandro was the child of parents who were "down on their luck." Indeed, the child himself seems, as a youngster, to have been afflicted with some of his parents' bad luck, for at four years of age he was unable to speak, whilst a year or two later he was considered to be an imbecile. But after attaining the age of ten his wit suddenly quickened and a flood of intelligence came upon him. He went to the Jesuit school in Como, and within five years he was the school's leading scholar.



Alessandro Volta, discoverer of the electric current.

"I had a diamond in my house," remarked his father on one occasion, "but I failed to realise it."

LATIN POEMS ON CHEMISTRY

At the age of nineteen, Volta was composing Latin poems on various chemical subjects, a fact which tells us that the growing chemical science of the day must have claimed him as a close adherent.

Finishing his education at the Royal Seminary in Como, Volta settled down to the humdrum life of a teacher. However, he seems not to have taken too kindly to the monotony of this career. Stirred up by the experimental writings of the famous Abbe Nollet, of France, he began experimenting for himself in the realms of frictional electricity. He entered into a voluminous correspondence with the learned Abbe, as well as with other pioneer electrical experimenters, including the famous English electrical and chemical pioneer, the Rev. Joseph Priestley, discoverer of oxygen.

THE ELECTROPHORUS

In 1775 Volta announced his discovery of the "Electrophorus," the principle of which he hit upon when studying the insulative properties of oil-impregnated timber.

The electrophorus (or "electricity-bearer") comprises a circular molded cake of resin suitably mounted on wood. Resting on its upper surface is a metal disc provided with an insulated handle.

The resin cake is electrically excited by rubbing a dry fur over it, after which the metal disc is placed in firm contact over it. The disc is then momentarily touched with the finger, and it is subsequently lifted out of contact with the resin. It will then be found to be heavily charged with electricity, so much so that it will be capable of emitting sparks.

At the same time, the cake of resin retains its charge, and it will induce a second and even a third and successive charge in the metal disc whenever the latter is allowed to make contact with it.

The explanation of the electrophorus's action is simple. The resin cake is charged negatively by the rubbing. On placing the metal disc on its surface the disc becomes positively charged on its lower or under surface and negatively charged on its upper surface.

A mere touch of the finger provides a leakage path for the whole of the upper-surface negative charge, the disc retaining only its positive charge which is capable of giving rise to sparks and to other static electrical phenomena.

Here, therefore, was a simple means of generating relatively strong static charges without continuous frictional rubbing, for once the resin cake was frictionally electrified the metal disc could again and again be charged up without much diminution of the charge on the resin base.

INVENTION OF CONDENSER

Volta gave a good deal of thought to the improvement of his electrophorus apparatus. In consequence of his ensuing experiments he not only improved the ordinary gold-leaf electroscope but he also devised an electronometer, or static potential measurer. More important still, he was led to the invention of the electrical condenser.

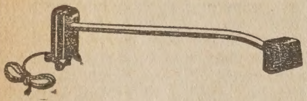
The principal of the condenser is so

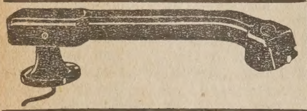
THE MAN WHO DISCOVERED ELECTRIC CURRENT

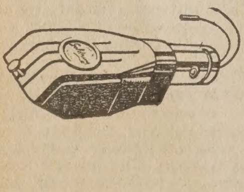
GOLDRING QUALITY PRODUCTS

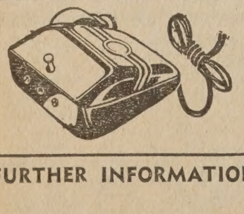
PICKUP RANGE

"Headmaster"
HYPERFIDELITY
PICK-UP









Type	Output	Frequency Range	Stylus	Particulars	Price
HEADMASTER					£ s d
Supplied with: 1 Cartridgarm 12". 3 Cartridges. Tonaliser C. Multiple transformer.	45 millivolt 250 millivolt with transformer.	30-18000	Sapphire	Highest quality reproduction of all records. Interchangeable cartridges with sapphire points of correct dimensions. Easy & quick operation of plug-in cartridge. Recognised by experts as the best & cheapest Pickup on the market.	
				COMPLETE	10/14/6
				Cartridge arm	1/8/6
				Each cartridge	1/8/6
				Tonaliser	2/16/-
				Transformer	2/6/9
				Cartridge Arm (16")	1/19/6
LIGHTWEIGHT PICKUPS					
121	.25 Volt	30-8000	Replaceable Sapphire	High Output.. Medium frequency range. Ideal for use with standard receivers. Low needle pressure minimising record wear.	3/13/10
122	.25 Volt	30-8000	Replaceable Sapphire	As above, but finished in florentine bronze.	3/13/10
123 (MAGNA)	.25 Volt	30-8000	Replaceable Sapphire	As above, but with one Interchangeable Cartridge. Ideal for Commercial or P.A. equipment with quick needle changing or replacement essential.	3/13/10
125	.25 Volt	30-7000	Standard Needles	The Lightweight P.U. using standard size Sapphire, steel, or thorn needles.	2/17/-
BANTAM PICKUPS					
130 130/IVORY	.3 Volt	40-7000	Standard Needles	Inexpensive, sturdy, reliable. Really good value.	2/1/2 2/5/6
REPLACEMENT HEADS					
G.1	.25 Volt	30-8000	Replaceable Sapphire	Owners of Garrard Changers from R.C.4 to R.C.70, can easily and without skill IMPROVE their reproduction and preserve their records by using this Lightweight Head. Low needle pressure and all other advantages of Lightweight Pickups.	2/15/9
G.2	.25 Volt	30-7000	Standard Needles	As above, but using standard size Sapphire, steel or thorn Needles. Low needle pressure and most advantages of Lightweight Pickups.	2/5/3
PICKUP HEADS					
112	.3 Volt	45-5000	Standard Needles	Convert your Portable Gramophone into a Record Player simply by connecting the Pickup Head to the Wireless set.	1/13/4
112/Ivory	.3 Volt	45-5000	Standard Needles	As above, ivory finish.	1/15/1

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widely known that there is no need to occupy valuable space in again describing it. Let it be said, therefore, that Volta gave a long description of his plate condenser in the Royal Society's *Philosophical Transactions* for 1782 (about three years after he had originated the device), and that by means of this simple yet fundamental appliance he was for the first time able to store up minute electrical charges until they were able to produce plainly demonstrable effects.

In 1779 Alessandro Volta was appointed to the vacant professorship of Physics in the University of Pavia. It was an important teaching and academic post, for Pavia had become a noted centre of Italian learning, and it had gathered a name for itself in respect of its advanced scientific teaching.

It was now that Alessandro Volta started on his immortal investigations which, in the end, led him to the discovery of the electric current and of a simple means of generating it.

GALVANI VERSUS VOLTA

Galvani, who had caused such a stir in continental scientific circles with his discovery of so-called "Animal Electricity," was, at that time, a professor of Anatomy in the University of Bologna. He had made his name celebrated by his theories of animal electricity, and there were few who were likely to dispute his contentions.

But Alessandro Volta, with his improved electroscopes and electronometers, with his newly constructed condensers, and his superior electrical knowledge, was able to repeat the "frogs' legs" experiments of Galvani with a greater scientific exactitude.

Volta obtained the same results as Galvani, but as we have seen, his basic interpretation of them was altogether different. In short, Volta entirely refuted the theories and contentions of his contemporary, Galvani. Thus began an urgent scientific controversy, an academic contest during which feeling seemed, for a period, to run dangerously high on both sides, but which in the end concluded with a decisive victory for Volta's experiments and Volta's reasonings.

This strenuous contention between the professional anatomist and the professional physicist was no mere storm in a teacup. It raged throughout Europe. It penetrated into British scientific circles as well, splitting the scientific world of the day into two sometimes bitterly opposed factions, the **Galvanists** and the **Voltaists.**

EXPERIMENTS ON CRIMINALS

An entire volume could be written on the subject of this early scientific controversy. But such a volume has not yet appeared. It would, however, tell of the manner in which the Galvanists applied their experiments with considerable ingenuity to the bodies of cows, calves, sheep and pigs in order to contort the limbs of these dead animals into life-like movements through the agency of "animal electricity."

Some Common Scientific Fallacies

Teacher deserves a big, fat zero if she says flatly that at a given pressure:

Water always freezes at 32 degrees Fahrenheit;
Mercury always freezes at minus 37.7 degrees;
Tin always freezes at 449.4 degrees;
Gallium always freezes at 85.5 degrees.

Scientists have cooled all four substances far below their so-called "freezing points" without having them freeze.

They have "super-cooled" water 71 degrees Fahrenheit below its freezing point; mercury, 72 degrees blow its freezing point; tin, 198 degrees and gallium, 125 degrees.

Not only must the temperature and pressure be right for a substance to freeze, but particles about which material freezes, called "nuclei," must also be present, scientists explain. They have been able to super-cool water, mercury, tin and gallium by ridding their samples of nuclei, which are usually present in most fluids. If there are nuclei in a given material, then teacher is 100 per cent right about the freezing point.

Water below its freezing point is often found in nature, particularly in the form of clouds. The water in super-cooled clouds is without nuclei, points where the freezing can begin, so it does not turn to ice. Discoveries of methods to produce snow from super-cooled clouds are based on putting nuclei into such clouds, resulting in transformation of water droplets in the cloud to snow crystals.

Metallurgists have made "clouds" of super-cooled gallium, tin and mercury, by dispersing those metals in their liquid form as minute droplets suspended in oil. Some of the droplets may contain nuclei, but the freezing that begins in them cannot spread to the others through the oil, so that those without nuclei can be reduced in temperature far below their freezing point without freezing.

Scientists explain that in some cases there are limits beyond which substances cannot be cooled without freezing. They believe that they have super-cooled water and possibly mercury, tin and gallium as much as possible, as nuclei seem to form spontaneously below the temperatures reached.

In a word, Volta discovered that electricity made its appearance whenever two dissimilar metals came into contact, particularly in the presence of salt solutions.

THE "CROWN OF CUPS"

In order to prove his contention that electricity can be produced by the action of mineral salt solutions on dissimilar metals Volta devised his now famous and classical "corona," or *Crown of Cups.*

The "Crown of Cups," was the world's first electric battery, the first current generator ever made. In it plates of zinc and silver (afterwards zinc and copper) were immersed in pairs, one zinc plate being soldered up to the adjoining silver (or copper) plate in the adjacent cup. The cups were filled with a solution of common salt. On joining up the two end electrodes of the series of cups (i.e., the silver and the zinc plate) a steady supply of electricity was drawn from the cups.

Owing to what we now term the "polarisation," of the electrode plates, the action of the Crown of Cups was never very satisfactory, but about the year 1800 Volta gave to the world his famous "Pile," the product of eight years' work on the "animal electricity" controversy.

VOLTA'S PILE

Volta's Pile was described in a letter which was read before our Royal Society in June, 1800. In this letter Volta says that his newly invented pile "consists of several dozen discs of copper, brass or silver, and an equal number of discs of tin or zinc of the same size. Between each pair is a cloth disc damped with salty water, the whole forming a pile or column. First copper, then zinc, then cloth and so on, being careful to complete the pile with a metal disc different from that which began it."

Here was the practical outcome of Volta's theories on the generation of electricity by the contact of dissimilar metals in the presence of salt solutions.

The pile was enclosed in a light frame of wood or glass uprights. A wire was attached to its top disc and another wire to its bottom disc. On joining the two wires together a continuous current flowed through the circuit. Moreover, the current flow was constant, and it could be increased or decreased by varying the number of discs in the pile.

THE VOLTAIC CELL

From the simple Crown of Cups and the Voltaic Pile, it was but a short step to the Voltaic cell made by placing a zinc and a copper plate in a vessel containing dilute sulphuric acid. But this was the last of Volta's discoveries. Indeed, from a point of view of discovery, Volta's increasing fame seems to have been his downfall. The principle of the cell was enormously developed in England at the hands of Davy, Wollaston, Cruikshank and others. It was used for the electrolysis of water, for the liberation of new metals by electrolytical means, for the production of the electric arc and for various other uses, yet never an interest did Volta himself seem to take in these British advances.

In 1823 he suffered an apoplectic seizure, from which he never really recovered. The end came nearly four years later, when, on March 5th, 1827, he died after a day or two's illness.

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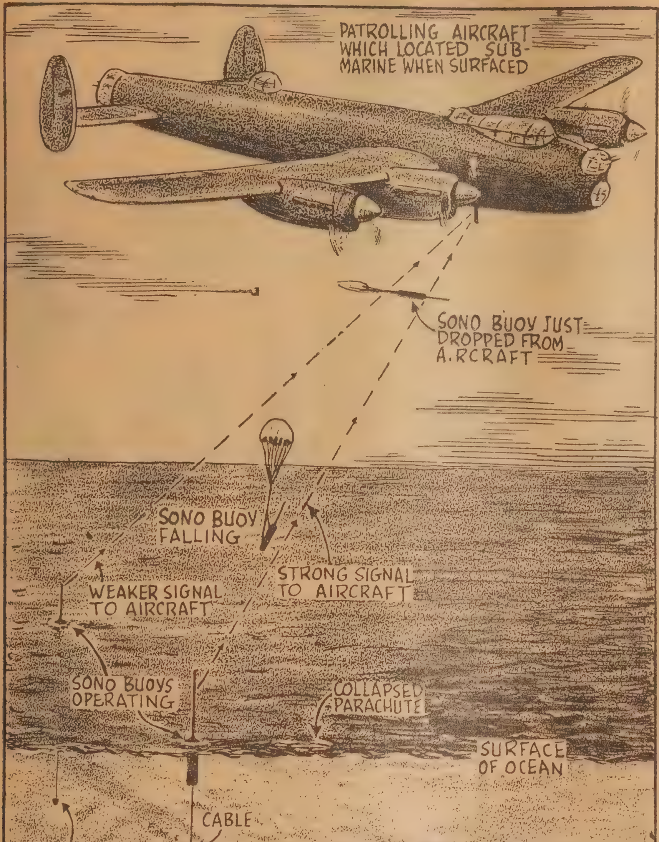
HOW IT WORKS—THE SONO BUOY SET


PATROLLING AIRCRAFT WHICH LOCATED SUBMARINE WHEN SURFACED
SONO BUOY JUST DROPPED FROM AIRCRAFT
SONO BUOY FALLING
STRONG SIGNAL TO AIRCRAFT
WEAKER SIGNAL TO AIRCRAFT
SONO BUOYS OPERATING
COLLAPSED PARACHUTE
SURFACE OF OCEAN
CABLE
SUBMARINE DIVING
HYDROPHONE PICKING UP WEAKER SIGNAL
HYDROPHONE, ATTACHED TO BUOY NEARER TO SUBMARINE, PICKING UP STRONG SIGNAL

A RADIO device of very great importance in the struggle against enemy submarines was developed during World War II. Known as the Sono Buoy, the invention made it possible for an aircraft to pinpoint the position of a submerged and invisible U-boat.

In operation, the Sono buoys each send out a signal of a distinctive, pre-determined frequency. The strength of the signal depends upon the impulses received from the hydrophone suspended beneath the buoy.

As can be seen from the diagram-sketch of the patrol aircraft and the submerged U-boat, buoys are dropped when the submarine is located. As the submarine dives further buoys are dropped.

By noting the position of the "drop" of each buoy, the crew of the aircraft can determine the course being taken by the submerged U-boat simply by a comparison of the strength of the signals received from the various buoys. Each buoy is recognised by its signal frequency.

Also shown is the layout of a British-designed Sono buoy.

The buoy consists of a tubular casing containing a small transmitter. A color band on the outside of the casing indicates the signal frequency used by the particular buoy.

A small parachute attached to the buoy lessens the speed of its fall and reduces the impact with the sea.

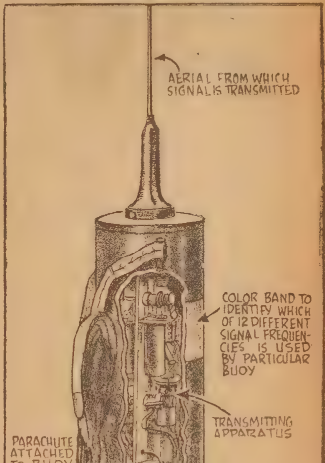
As soon as the buoy strikes the sea, a cable in the base unwinds so as to lower the hydrophone, which is finally suspended 25ft below the buoy. The transmitting apparatus comes into operation at the same time.

The hydrophone is sensitive to the "noises" emanating from any submarine in the vicinity. It picks up these "noises" and relays them to the transmitter, which, in turn, sends them on as a weak or strong signal to be picked up by the aircraft.

With the submarine located, the aircraft is able to guide light naval vessels to the spot, and the submarine's course can then be picked up by the detection devices used by the ships.

It is visualised that with the development of the "Schnorkel" device

(Continued on Page 98)


AERIAL FROM WHICH SIGNAL IS TRANSMITTED
COLOR BAND TO IDENTIFY WHICH OF 12 DIFFERENT SIGNAL FREQUENCIES IS USED BY PARTICULAR BUOY
TRANSMITTING APPARATUS
PARACHUTE ATTACHED TO BUOY
BATTERIES
SUPPORT
BATTERIES
SUPPORT
CABLE IN BASE OF BUOY WHICH UNWINDS AUTOMATICALLY WHEN BUOY STRIKES SEA, SUSPENDING HYDROPHONE
HYDROPHONE, WHICH IS SUSPENDED 25FT. BELOW THE BUOY TO PICK UP UNDERWATER SOUNDS

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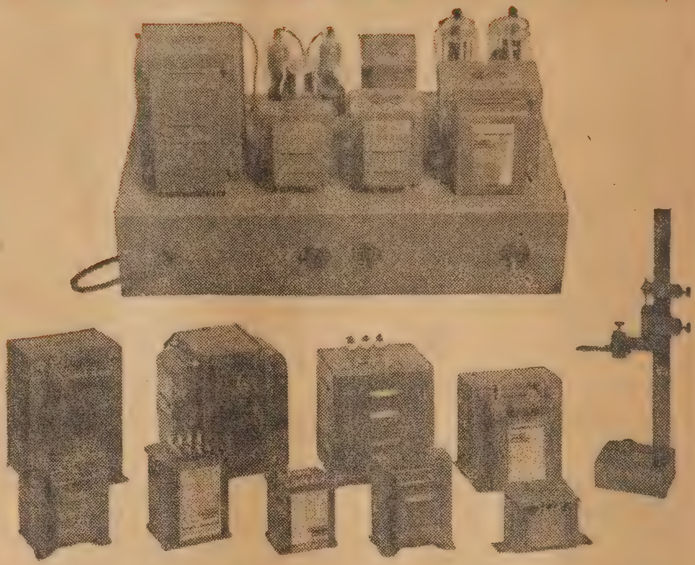

RED LINE specialise in Audio Frequency Transformers up to Frequency Modulation standards; Power Transformers up to 2 KW rating. BUT— see RED LINE for Transformers of ANY specification whether for Industrial Applications, Electronic Controls, Broadcasting, Amateur Transmitting or Public Address Systems.

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MAKING A CENSUS IN MODERN WAY

The vast job of taking a modern census is now a task for machines in the USA. A recent demonstration of such a machine was given to the Census Bureau of the International Business Machines Corporation.

This picture was taken when the machine was presented to the Bureau. It is estimated that, working by hand, it would take 500 people all their working lives to accomplish the work of the machines in the 1950 census.

THE demonstration revealed that the new machine combines in one operation the simultaneous functions of classifying, counting, accumulating and editing. The machine then prints the statistical data resulting from groupings of information and automatically balances the totals to ensure their accuracy.

Prior to the development of the Electronic Statistical Machine, these functions required one or more operations with a number of machines. It is estimated that working by hand, it would take 500 persons all of their working lives to accomplish what the Electronic Statistical Machines will do during the 1950 Census period.

The editing function is one of the most fascinating features of the new machine, since it automatically detects and rejects punched cards containing improbable data. For example, a card might indicate through error that an eight-year-old boy is a war veteran. The electronic machine's editing feature would automatically reject this card. When the technique is applied, automatic editing eliminates the need for manual editing, which involves the visual examination of millions of questionnaires to make certain that entries were properly made in the proper places, and that the information is reasonable and consistent.

HIGH CAPACITY

The Electronic Statistical Machine has speed as well as versatility. It has a capacity for counting up to 10,000 units in each of 60 different classifications, while simultaneously sorting the cards into predetermined groups at the rate of 450 cards a minute. Totals for major classifications can be broken down simultaneously into smaller classification. For example, the total number of farms in a State can be counted at the same time that they are broken down into as many as 60 size and ownership ranges.

The new machine is equipped with two separate printing mechanisms, which operate in a manner similar to a typewriter carriage. These allow the machine to print on a single line, not only the totals for each of the 60 groups, but also the grand totals. As a further check for accuracy, the printed totals of each of the 60 groups are balanced automatically against the grand totals. At the same time these other operations are being performed, all of the information can be relayed automatically to another machine connected by cable to the statistical machine, and punched into cards which are used later in the preparation of still other statistical reports.

Use of Electronic Statistical Machines, along with other improved machine tabulation equipment developed by the Census Bureau, is expected to speed up release of information to be collected in the 1950 Census regarding America's 150 million people, 45 million homes, and 6 million farms. The millions of facts collected in the Census will be recorded on 270 million punched cards —one for each person, one for every dwelling unit, and eight or more for every farm.

CARD SYSTEM

The task of transferring the basic facts from Census questionnaires to the cards by means of key punch machines will take about a year, Approximately two million cards will be punched per day at the peak of operations.

Classifying, counting and tabulating the results will be completed by the spring of 1952. It is estimated that this operation will be equivalent to running 10 billion cards through one machine.

The Seventeenth Decennial Census will cover agriculture, population, and housing. The enumeration will start on April 1, 1950, and will take about two weeks to complete in urban areas, and about a month in rural sections. Agriculture Census forms will be distributed to farmers by mail in most States in advance of the population enumeration,and the completed forms will be picked up when the enumerators come around to ask the population and housing questions.

The Electronic Statistical Machine contains:

144 tubes.

283 relays.

240 unit counter positions.

75 circuit breakers.

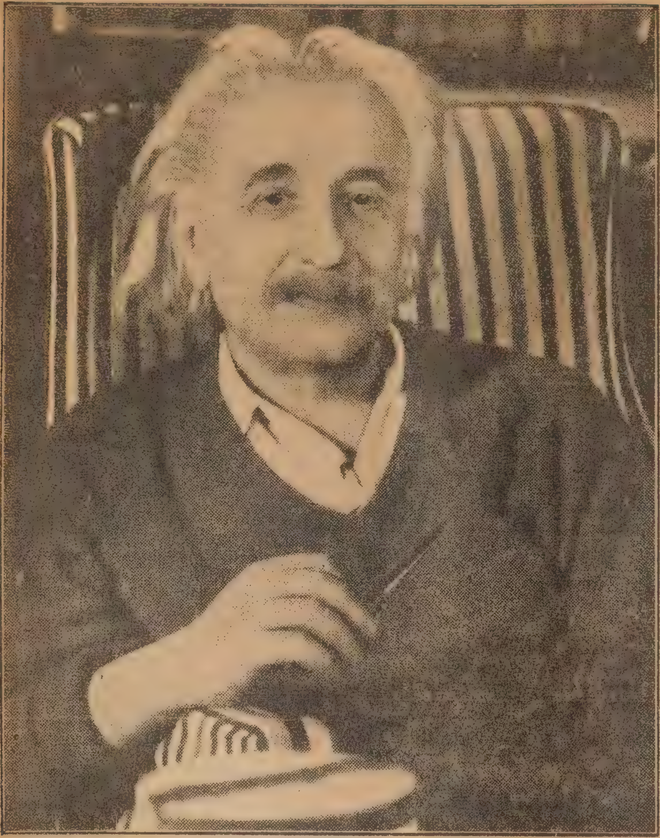
30 emitters.

10 high speed accumulating positions.

270 possible printing positions.

13,500 taper plug connections.

50 miles of wiring.



Albert Einstein, the scientist of the century, will be 71 on March 14 this year He is unconventional in his habits and his dress merely because he has no need to be otherwise. The impact of his work on human thought is incalculable.

GENIUS OF ALBERT EINSTEIN

The name of Dr. Albert Einstein has again become prominent by his announcement that he has completed, after 30 years' work, a mathematical equation which completes his "unified field theory." This theory is an attempt to set forth in one series of equations all the laws which govern the action of the two primeval forces of nature, namely gravitation and electro-magnetism.

WHEN it is considered that practically all of Nature's phenomena are caused by these two forces, the importance of a simplified mathematical basis to explain them is apparent.

It is doubtful if science can ever find the ultimate nature of electricity magnetism or gravitation. Yet it would be sufficient to know just what causes these great motive powers of the universe to have the effects they do.

In order to do this, it is necessary to be sure that the laws governing these forces are universal throughout space. Without this harmony of Nature we would be groping in darkness trying to explain the universe with laws which apply only to our own planet.

In the nineteenth century, Faraday and Oersted proved that a current of electricity was always accompanied by a magnetic field. Later it was shown that this electro-magnetic field was responsible for the propagation through space of light rays, radio waves, and the many other disturbances. So it was that electricity and magnetism became united into a single force.

MATTER AND ATOMS

It has been shown that all matter consists of atoms involving the action of electrical particles. All the forces which manifest themselves in the universe involve matter, and therefore electro-magnetic action.

Gravitation is a force similar in many respects to electro-magnetism. This can be seen from the fact that all the planets revolve within the gravitational field of the sun, in a manner similar to the electrons which revolve in the electro-magnetic field of the atomic nucleus.

It has never been established that gravitation is an electro-magnetic effect, although many scientists have devoted their energies to the end of proving it to be so.

Einstein himself thought he had arrived at this conclusion when he published his first "unified field theory" in 1929, but he later rejected it because of its insufficiency.

UNIFIED FIELD THEORY

The meaning of the term "unified field theory" will be more clear when viewed from the standpoint of a set of laws which will explain gravitational and electro-magnetic fields of space and the fields inside the atom, as changes in the concentration and structure of the primeval fields of Nature.

If Einstein has succeeded in doing this, then he has at one stroke bridged the gap between the very big and very little, and the universe will have become to the scientist a harmonious structure in which all forms of motion as the movements of electrons in the atom and the motion of stars and island universes will be also related to changes in the electro-magnetic and gravitational fields.

One of the greatest difficulties encountered by physicists, in their attempts to explain the mechanics of the universe, is that of securing a "frame of reference," with which the factors of time and distance can be compared.

To we earthly inhabitants, the word "time" denotes a series of marks on the face of a clock or sundial, and "measurement" a series of marks on a rule. The time of a clock is to us a series of marks denoting a series of events. This is best described in Einstein's own words:—

"The experiences of an individual appear to us arranged in a series of events . . . the single events which we remember appear to be ordered according to the criterion of 'earlier' or 'later.' There exists, therefore, for the individual an I-time or subjective time. This in itself is not measureable. I can associate numbers with the events in such a way that a greater number is associated with the later event than with an earlier one. This association I can define by means of a clock by comparing the order of events furnished by the clock with the order of the given series of events. We understand by a clock something which provides a series of events which can be counted."

If you relate that statement with your own experiences, you will see how true it all is. A calendar is also simply a series of numbers associating a series of events.

To us a clock and a calendar are very useful, but they are of not much use to a scientist, who is constantly dealing with matters which involve complicated types of motion, as for instance, the motion of planets, galaxies and stars. Our time and the calendar have been based on the gyrations of our own solar system. An hour is really a measurement in space. It is an arc of 15 degrees in the rotation of the celestial globe. A year is the time taken for the earth to revolve around the sun.

NO FIXED TIME

The important point is that the clock and the calendar have been based on our own system. They have no relation to any other system. A day and a year on the planet Mercury are not the same so that if there are people on that planet they would have a different idea of the time.

So Einstein says in his Theory of Relativity that there is no such thing as a fixed point in the universe to which time can be referred; it is always dependent on the system, such as our solar system, to which it is referred.

When the scientist, therefore, takes into his observations the systems outside our solar system our own ideas of time have no meaning. There is no such thing as "now" in the universe. For instance, take a star which is 50 light years away. If we sent a radio message to it, it would take 50 years for the message to reach its destination and another 50 years for a reply to come back. When we look at the star through a telescope we are observing light that left the star 50 years ago. The star may not now exist but we won't know for 50 years hence. We can't say what is happening "now" on that star.

So Einstein says that time and distance are variable quantities and as such must be regarded if the scientist wants to describe the relations between moving systems. Time and distance are only relative. Even on our planet a man standing on the sidewalk sees two cars passing each other at 40 miles per hour. To him both are travelling at 40 miles per hour in opposite directions. But to the drivers of each car the other car passes at 80 miles per hour. In other words the time is dependent on the moving system to which it is referred.

But there is one thing in nature that is constant for all systems. That is the velocity of light. It has been amply proved that the velocity of light is unaffected by the motion of the observer or the motion of the source of light. It always travels at 186,284 miles per second.

If a light source was travelling towards an observer at say 100 miles a second it would be thought that the speed of the light itself would be to the observer 186,284 miles plus 100 miles per second.

LIGHT SPEED CONSTANT

Similarly, if the light source was travelling away at 100 miles per second the speed of the light should be 186,284 less 100 miles per second. But this is not so. At whatever speed the light travels towards or away from the observer its speed will always be 186,284 miles per second. The speed of light is constant throughout the universe.

Einstein concluded that this is a fundamental law in nature and also that the speed of light is the limit of speed in the universe. Nothing can ever travel faster than light.

This speed of light is therefore used as a constant in physics and is denoted by the letter "c."

By using this constant in a series of equations and modifying measurements of time and distance according to the velocity of the system under observation, Einstein was able to arrive at the conclusion that all the laws of nature preserve their uniformity when related to this series of equations.

by Calvin Walters

This discovery of the constant velocity of light has had tremendous repercussions on humanity when considered in relation to another assertion of Relativity.

As time and distance are relative quantities the mass of a body also varies according to its motion.

By "mass" is meant the resistance of a body to change of motion. It is more difficult to move a steam roller than a baby's pram because the roller has greater mass.

Now Einstein has said that the mass of a moving body increases as its velocity increases. This has been proved beyond doubt but the change in mass is not apparent until the body approaches the speed of light.

Einstein arrived at the conclusion that if the mass of a moving body increases with its velocity then the increase must come from somewhere. There is only one source, namely, its motion. As motion is a form of energy the increase in mass must come from its increased energy. Therefore, energy must have mass. Mass and energy are, therefore, equivalent, and matter and energy are one and the same thing.

By a mathematical process Einstein found a formula using the velocity of light as a constant. This formula gives the equivalent mass in any unit of energy. It is m equals E/C. Anyone who knows algebra can transpose and arrive at what has been termed the most important and famous equation in history. It is E equals mc squared. E stands for Energy; m stands for Mass and c stands for the velocity of light (approx. 186,000 miles per second) squared. In other words, the energy which belongs to a given mass is equal to the mass multiplied by the square of the speed of light. This is a vast amount of energy indeed.

This equation played a tremendous part in the development of the atom-bomb. It enabled the designers to calculate how much radio-active material must go into the atom-bomb to cause the desired explosion.

MASS AND ENERGY

It also explains how radium and other such materials can go on for millions of years ejecting particles. For each grain of the element must contain a vast amount of energy which is only gradually being released. It also explains how the sun and stars can radiate heat and light for billions of years.

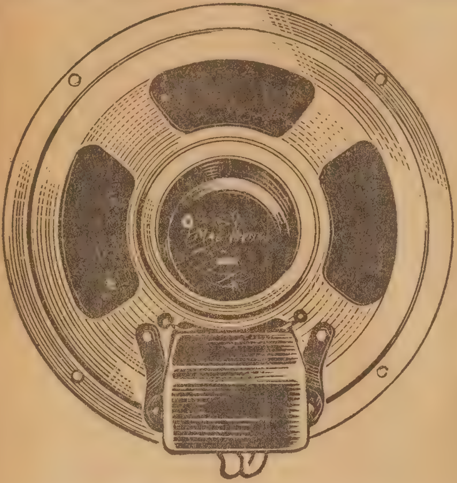
When matter begins to give up its mass and travels with the speed of light it becomes energy or radiation. On the other hand if energy becomes still and motionless it becomes matter. Mass is congealed energy.

In order that mass increase can become measurable the change of energy per mass unit must be very large. Radio-active substances are the only source known of such a change.

"An atom of a mass 'M'," Einstein says, "splits into two atoms of the mass M' and M" which separate with tremendous kinetic energy. If we imagine these two masses brought to rest—that is if we take this energy

(Continued On Page 44.)

FOR EVERYTHING in RADIO, AT ITS BEST, see W.F.



THE NEW MAGNAVOX CENTRE POLE PERMAGNETIC SPEAKERS

Available in 6", 8", 10", 12", with two magnet weights and with full range of matching transformers.

Model 6P2	£1/18/5	Model 10P1	£2/14/-
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Model 8P1	£2/2/8	Filter Chokes	7/1
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Complete with Brown's English headphones. In cream, green or yellow.

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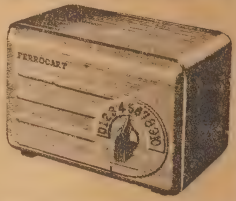

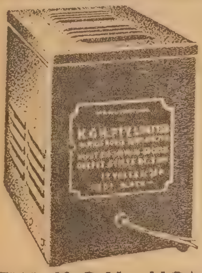

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This charger alone has the unique feature of being able to charge either a 6 or 12 volt battery at 5 and 2.5 amps.

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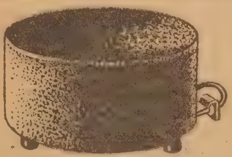

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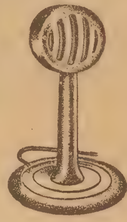
8" carries 112 lbs	£11/5/-
12" carries 175 lbs.	£15/8/-

Trade Inquiries Welcomed.



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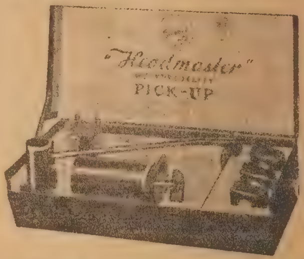
£6/17/6

W.F. carry a complete stock of car radio accessories and spare parts including:—

Telescopic aerials . . . Coaxial aerial leads . . . Battery leads . . . Aerial and battery connectors . . . Generator condensers . . . Suppressors for plugs and distributors . . . Speakers and housings.

THIS MONTH'S SPECIAL

Well known brand 15,000 ohm voltage dividers—usually 5/6 this month only. ea. **1/6**



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OPEN SATURDAY MORNINGS

Technical Review

The availability of the citizen frequency band around 450 mc in USA has set some pretty problems in developing equipment to operate in 'that region. This extract from Electronics illustrates an interesting possible approach to these micro-waves.

ENGINEERS interested in developing equipment for the citizens band and the mobile service could use to advantage tank circuits formed of parallel-plate transmission lines. Such lines are easy to handle and are readily adapted for use with lighthouse tubes.

To explore the possibilities of the parallel-plate construction, a transmitter was constructed. To provide the frequency stability required, a 25-mc quartz crystal oscillator was employed. This was followed by a frequency doubler, a tripler, and a power amplifier to provide output at 150 megacycles. Since conventional lumped constants were used, the circuit of these preliminary stages is not shown.

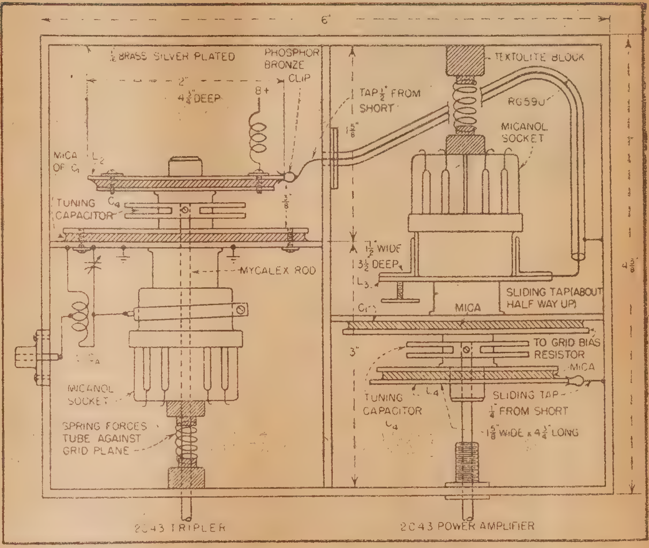

6"
½ BRASS SILVER PLATED
PHOSPHOR BRONZE CLIP
2"
4¾ DEEP
B+
MICA OF C1
L2
TUNING CAPACITOR C4
⅜
MYCALEX ROD
CA
MICANOL SOCKET
SPRING FORCES TUBE AGAINST GRID PLANE
TEXTOLITE BLOCK
TAP ½ FROM SHORT
1⅝
RG59U
MICANOL SOCKET
1½ WIDE
3½ DEEP
L3
C1
MICA
SLIDING TAP (ABOUT HALF WAY UP)
4⅜
TO GRID BIAS RESISTOR
3"
MICA
TUNING CAPACITOR C4
L4
SLIDING TAP ¼ FROM SHORT
1⅝ WIDE x 4¾ LONG
2C43 TRIPLER
2C43 POWER AMPLIFIER

Fig. 1.—Top view of box containing two lighthouse tubes and parallel-plate tank circuits.

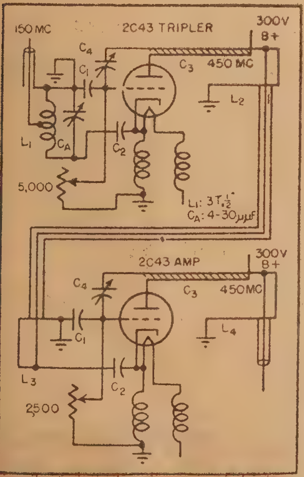

150 MC
2C43 TRIPLER
300V B+
C4
C1
C3
450 MC
L2
L1
CA
C2
5,000
L1: 3T, ½"
CA: 4-30μμf
2C43 AMP
300V B+
C4
C3
450MC
C1
L4
L3
C2
2500

Fig. 2.—Schematic diagram of tripler and final amplifier for 450 mc. Construction of C1 and C3 is shown in Fig. 1. Capacitors C3 are internal to G-E 2C43 tubes and capacitors C4 are the floating rotors.

To reach final frequency of 450 mc, a tripler using a lighthouse 2C43 is employed. This is followed by an additional 2C43 as a power amplifier. Both stages are operated with grounded grids. Figure 1 shows the construction of the two stages.

Calculation shows that a parallel flat-plate circuit would need to be slightly under 5 inches long to resonate at 460 mc with the grid-anode capacitance of a 2C43. For the higher grid-cathode capacitance it would need to be slightly shorter than the grid-anode line.

Since the distance between the anode cap and the grid plane is approximately 3-8 inch, the spacing between the anode plate and the grid plane is also approximtaely equal to 3-8 inch. This permits utilising a half-circular rotor as a tuning capacitor to resonate the plate and cathode tanks. By using simple 180-degree rotation, it is possible to utilise existing tuning dials.

The tripler-power amplifier circuits using parallel flat plates thereby eliminate the use of costly concentric-type cavities, and it is possible to obtain excellent efficiencies using the 2C43 as triplers and power amplifiers. The apparent plate efficiency of the tripler is between 25 and 30 per cent

(Continued on Page 21)

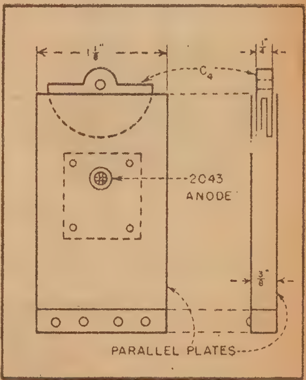

1⅛"
¼"
C4
2C43 ANODE
⅜"
PARALLEL PLATES

Fig. 3.—Inductors L2, L3 and L4 are parallel-plate tanks. Floating rotors C4 tune L2 and L4 as shown above. Dimensions of plates are given in Fig. 1.

SOLVE YOUR PROBLEMS WITH TAYLOR TEST EQUIPMENT

MODEL 47A-P

MUTUAL CONDUCTANCE VALVE AND MULTITESTER

MULTITESTER RANGES. 1000 ohms per volt A.C.-D.C.

D.C. Volts	D.C. Current	A.C. Volts	Resistance
0-120 m.V.	0-0.6 mA	0-3	0.5-22.5-1000 ohms.
0-3	0-6 mA	0-15	50-2250-100,000 ohms.
0-15	0-30 mA	0-150	x 500-22,500-1 megohm.
0-150	0-150 mA	0-300	x 5000-225,000-10 Megohms.
0-300	0-1.5 Amps	0-600	
0-600			x with external battery.

Fitted with large direct reading meter with illuminated dial and OVERLOAD PROTECTION. Tests over 2000 American English and Continental valves including latest types. Filament volts range from 1.1 volts to 117 volts. Filament continuity and element shorts shown directly on meter. Cathode leakage read in megohms. The instrument is housed in a solid oak carrying case and supplied with comprehensive instruction manual. Also available as valve tester minus multitester ranges—Model 45 A-S.

PRICE £39/17/6 Plus sales tax.

IMMEDIATE DELIVERY

MODEL 75A

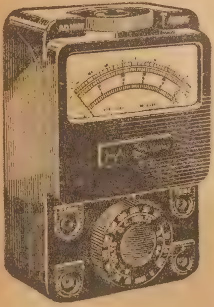
RANGES 20,000 ohms per volt A.C.—D.C.

D.C. Volts	A.C. Volts	A.C.-D.C. Current	Decibels	Resistance
0—0.1	0—1	0—50 uA	—30 to —5	1—50—10,000 ohms
0—2.5	0—2.5	0—5 mA	—22 to +3	1000—50,000—10 Megohms
0—10	0—10	0—50 mA	—10 to +15	*10,000—500,000—100 Megohms
0—50	0—50	0—500 mA	+4 to +29	
0—250	0—250	0—5 Amps	+18 to +43	*With external battery.
0—1000	0—1000		+30 to +55	

This is a robust 20,000 ohms per volt 50 range universal multimeter designed for accuracy and stability. Fitted into an attractive case, the meter is provided with instantaneous OVERLOAD PROTECTION. The clear, easy to read scale has a length of 4 inches. An internal buzzer is provided for quick continuity tests. Complete with test leads.

PRICE £19/15/- Plus sales tax.

MODEL 120A POCKET MULTIMETER



RANGES — 1000 ohms per volt A.C.—D.C.

D.C. Volts	D.C. mA	A.C. Volts	Resistance
0—0.25	0—1	0—10	0.5—20—2000 ohms
0—10	0—10	0—50	50—2000—200,000 ohms
0—50	0—50	0—250	*500—20,000—2 Megohms
0—250	0—500	0—500	*5000—200,000—20 Megohms
0—500		0—1000	
0—1000		0—2500	*With external battery.
0—2500			

This is an accurate pocket size instrument using a robust, sensitive meter movement fitted with instantaneous OVERLOAD PROTECTION and is housed in a high grade moulded case. All resistors used for voltage and current ranges are adjusted to an accuracy of 1%. Supplied complete with test leads.

DIMENSIONS: $4\frac{7}{8}$" x $3\frac{1}{8}$" x 2"

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Best for
TEST EQUIPMENT

Manufactured by:—TAYLOR ELECTRICAL INSTRUMENTS LTD., GREAT BRITAIN

LATEST LENS FOR LARGE TELEVISION IS PLASTIC

The new lens gives a 16-inch value to a 10-inch picture.

One of the difficulties associated with the display of television pictures has been to obtain large images economically. One approach made practicable by high definition television is the use of a magnifying lens or screen to enlarge the picture projected on a comparatively small cathode ray tube.

THE lens itself, however, is by no means a simple or a cheap device in practice. For this reason, the announcement of a flat, plastic lens for the job is of considerable interest. It should be even more effective with our proposed 625 line television than with the American standard of 525 lines. This extract comes from Radio-Electronics.

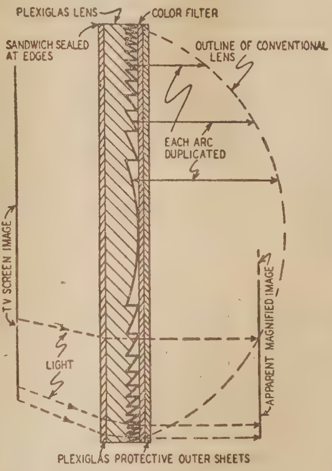
A new thin, flat plastic lens for enlarging the television image on home receivers is the latest accessory for TV fans. It operates on the Fresnel principle of magnification and is known as the magna-screen. Weighing but a few pounds, it is easily attached to any type of receiver by means or brackets supplied with the lens.

It is adjustable and can be quickly changed to give any desired degree of magnification within its scope. The magna-screen is free from edge distortion and provides glareless viewing of the image at a reasonably wide angle.

The lens operates on a principle similar to the Fresnel lens used in lighthouses. Its magnifying power is based on the fact that carefully designed optical prisms or ridges are impressed in the plastic from a master die, each prismatic line corresponding to a segment of the curved surface of a thick glass lens of the usual type.

How the rays of light are refracted through the successive ridges or prisms in the lens is shown in the diagram. As the circular ridges or prisms approach the outer edge of the lens their angle becomes steeper, whereas toward the centre of the lens the prismatic ridges flatten out until they are nearly flat. In this manner the lens is able to pick up rays of light from all angles and redirect them beyond the lens to form an enlarged (virtual or apparent) image, which is viewed by the observer.

The magnifying element of the screen is formed from a sheet of thin plastic, into which hundreds of the prismatic grooves are pressed. In the assembly there is a green filter which eliminates glare, together with protective outer sheets of plastic (plexiglas), the whole unit being sealed at the edges. When used with a 10-inch television tube the image can be enlarged up to the size normally received on a 16-inch-diameter tube.



Constitution of the magna-screen is shown in cross section drawing.

Plastic lenses of this type are made by cutting ridges into a brass or other suitable metal mould, which is heated and pressed into the plastic sheet. The grooves are very fine in some parts of the lens, running as high as 200 or more to the inch. The circular rings or grooves can be seen when looking at the screen; but when placed in front of a TV picture tube the lines are not visible because of the smoothing out or resolving effect of the overlapping rays of light.

These new flat plastic lenses are designed for gathering the light from a given source, such as the bright image on a TV picture tube, and are not suited for use as projection lenses. They do have the valuable property of spreading the light evenly across the field of vision. A defect met with in many simple lenses, that of spherical aberration, is thus practically eliminated in the new thin plastic lenses.

The magna-screen is mounted in a neat wooden frame and comes in three sizes: 8 x 10 inches, for sets with 7-inch tubes; 9 x 12 inches, for seven and 10-inch tubes; and 11 x 16½ inches, for sets with 10 and 12-inch tubes. The brackets supplied with the lens permit using it on any table set, and it is available mounted on a floor stand for use with console TV receivers.

The magna-screen is made of Rohm and Haas plexiglas, an optically-clear, extremely strong light-weight acrylic plastic by the plastic division of the Willson Camera Co.

GRINDING CRYSTALS FOR 100mc

MODIFICATIONS of conventional techniques for grinding quartz crystals between abrasive-charged lapping plates now make possible the production of 0.001-inch thick crystals with a high degree of parallelism and flatness, permitting fundamental crystal frequencies of 100 mc and higher. Breakage is almost non-existent during grinding, but difficulties in handling and properly measuring such thin crystals have so far prevented determination of the limiting thickness for the equipment.

The lapping method evolved is an improved form of the square block and cell method and exists in two slightly different models—the inkwell and the tall plunger. The inkwell type has a conical exterior and is essentially a keyed and closely-fitting plunger and cylinder. The crystal is attached to the plunger by means of a drop of oil; the unit is then inverted and placed on the lapping plate.

The crystal is thus confined between the piston and plate by the cylinder walls. A nest drives a number of such units over the lapping plate. The tall plunger model differs mainly in having a taller piston sliding on bearing screws by which the amount of wobble can be precisely controlled.

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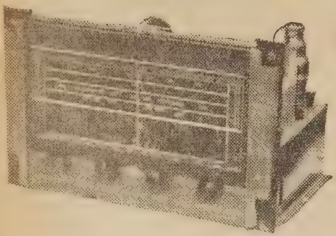

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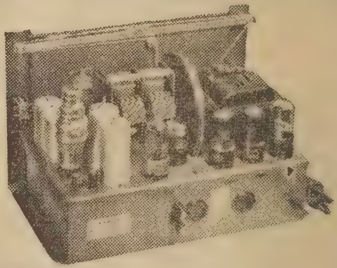

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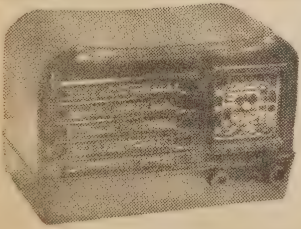

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four valve broadcast receiver in attractive bakelite cabinet, walnut finish, size 11" x 7" x 5½" deep. New type high gain coils and valves make this set an outstanding performer.
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CLASSICRADIO MANUFACTURERS OF COMMERCIAL RECEIVERS FOR 12 YEARS

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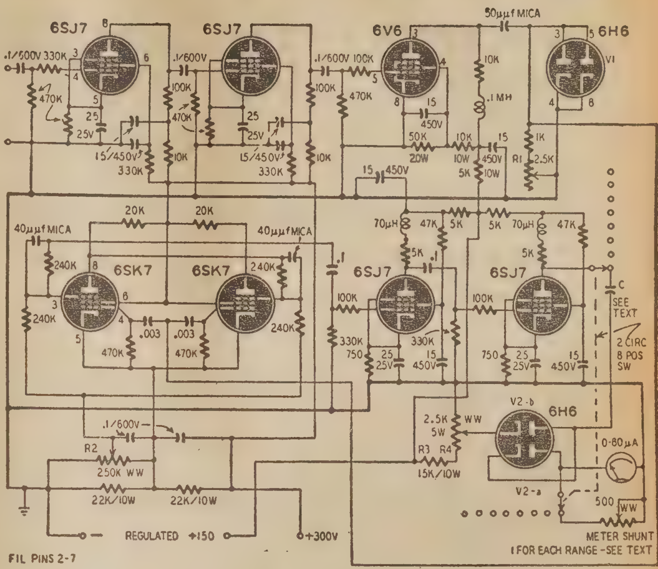
FREQUENCY METER FOR AF ULTRA SONIC RANGES

Despite the apparent limited application of an instrument of this type we have been asked questions concerning such a design more than once. This circuit, reprinted in Radio Electronics, has many points of interest.



The instrument indicates the frequency of signals of any wave form or amplitude.

DESCRIBED in The Review of Scientific Instruments, this electronic frequency meter measures frequencies between 20 cycles and 160 kc, independently of amplitude and waveform.

The signal is applied to the input terminals and amplified by two 6SJ7 high-gain amplifiers. A 6V6 is driven beyond cutoff and to saturation so it clips the positive and negative halves of the signal and produces square waves of the same frequency as the input signal.

The square waves are differentiated and applied to a diode clipper V1 which removes the positive pulses. The negative pulses are applied to the control grids of a pair of 6SK7's in a modified Eccles-Jordan multivibrator circuit. This circuit is so connected that one tube is cut off and the other conducting at all times. The multivibrator "flips" when a negative pulse is applied to the grid of the nonconducting tube.

POSITIVE PULSE

A positive pulse has no effect on the circuit. The first negative pulse "flips" the multivibrator and the next makes it "flop"; thus, two negative triggers are required to make the multivibrator go through one complete cycle.

The output of the multivibrator is a square wave one-half the frequency of the input signal, thus simplifying high-frequency compensation and increasing the useful range of the meter. Because the multivibrator output is distorted at high frequencies, it is fed to cascade-connected 6SJ7's working as clippers. These produce square waves whose amplitude is constant, regardless of the input frequency and amplitude.

SQUARE WAVES

The square waves are applied to a 6H6 discriminator through capacitor C, which is charged through diode V2-a, resistors R3, R4, and the output impedance of the second 6SJ7 clipper during the positive half of the square wave. During the negative half of the cycle, C discharges through V2-b, the meter, and the clipper impedance. If the time constants of the charge and discharge circuits are equal, the meter current is determined by the size of C and the frequency of the square wave. Therefore, the meter can be calibrated to read directly in cycles per second.

Ranges are switched with a 2-circuit, eight-position rotary switch that changes the value of the charging capacitor C and the meter shunts. The high-frequency ends of the ranges are 160, 800, 1800 cycles and 8, 16, 40, 80, and 160 kc, when C equals .05, .01, .005, .0019, .0005, .00025, .00018, and .00009 uf. All meter shunts are 500-ohm potentiometers.

To adjust the instrument, apply an audio signal to the input terminals. Use a scope to check the triggering pulses at the grids of the 6SK7 multivibrators. A sharp negative pulse should be observed. Adjust R2 for a square wave when the scope is connected between ground and either plate of the multivibrator. Adjust R1 for reliable triggering action. Adjust R4 until the meter reads off scale (about 100 ua) at the full-scale frequency of one of the ranges. Bring the meter back to full scale with the appropriate shunt. Calibrate the scales with a wide-range a.f. signal generator.

COLD WEATHER APPARATUS

A UNIQUE cold weather apparatus, which can measure the skin temperature and heat loss of 38 different areas of the body is being used in sub-zero studies.

It is a hooded suit with built-in tubes and wires that connect with 38 body points. It works something like a telephone switchboard, for you can dial any part of the body and receive its response recorded on a graph.

In addition, a chest panel on the suit is connected to another piece of apparatus which measures the heat production of the body.

TRANSMITTER FOR CITIZEN RADIO BAND

(Continued from Page 17).

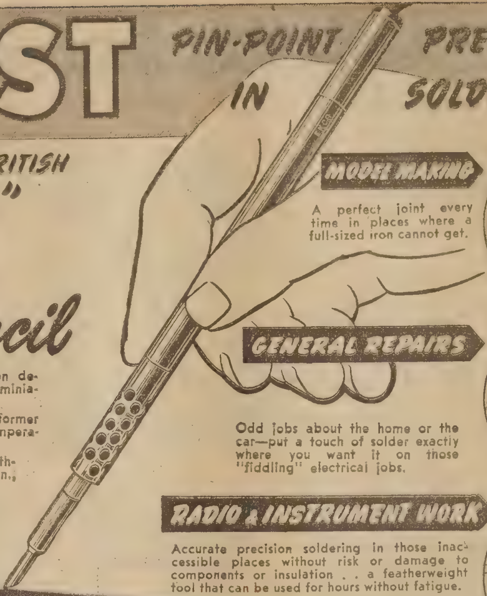
and the power amplifier between 55 and 70 per cent. Power gain through the power amplifier was approximately 4 to 1 at 300 plate volts.

Coupling from the tripler plate to the power-amplifier cathode line is done by tapping down on the line with a sliding piece of phosphor bronze on the centre conductor of RG59U coaxial cable. On the tripler plate and amplifier plate, the tap is very close to the shorted end, while it is nearly half-way up the line on the cathode tank line of the power amplifier. It is necessary to add a small padder in the cathode tank to compensate for various tube grid-cathode capacitances. This is absolutely essential to realise maximum performance from the power amplifier.

Power drive to the tripler is about 3½ watts at 150 mc. Power output at 450 mc is 7 watts. This is accomplished by staying within cathode current ratings and plate dissipation ratings of the 2C43.

AT LAST

PIN-POINT PRECISION IN SOLDERING



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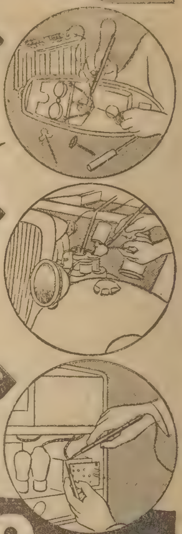

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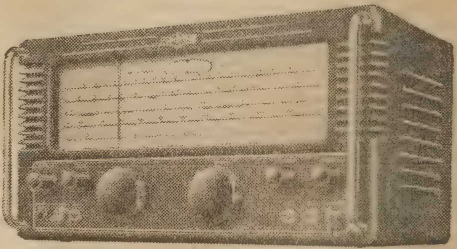

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Featuring:—

- Coverage 480 Kc/s to 30.5 Mc/s.
- 200:1 ratio dial reduction.
- Modern miniature valves.
- 3 watts of audio.
- Double detection superheterodyne (1600 and 85 Kc/s).
- Stabilised H. T. supply.
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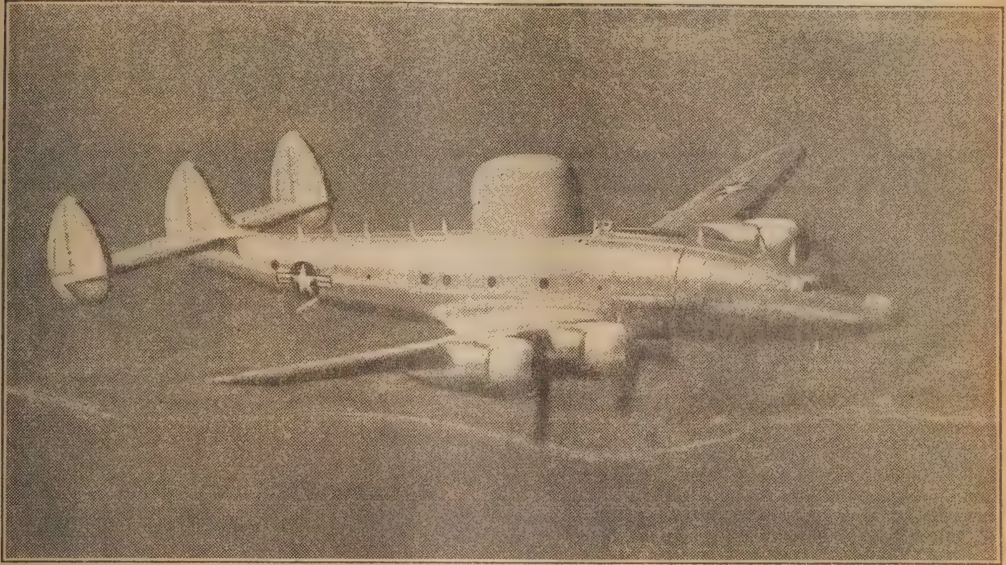
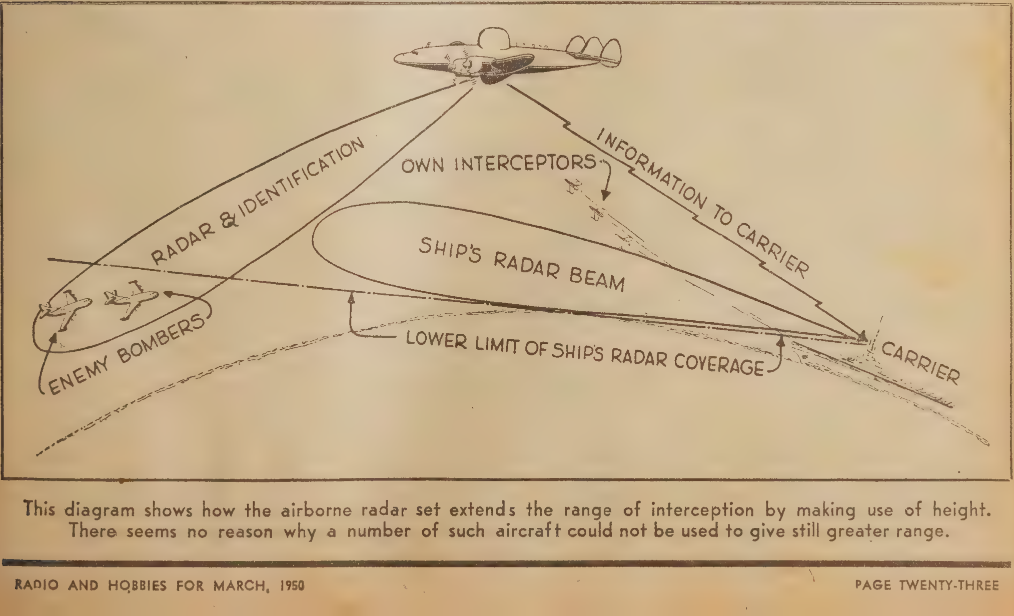
- VICTORIA: J. H. MAGRATH & CO., 208 Little Lonsdale St., Melbourne.
- WILLIAM WILLIS & CO., 428 Bourke Street, Melbourne.
- N.S.W.: JOHN MARTIN PTY. LTD., 116-118 Clarence St., Sydney.
- QUEENSLAND: CHANDLERS PTY. LTD., Cnr. Albert and Charlotte Sts., Brisbane.
- WEST AUSTRALIA: CARLYLE & CO. LTD., Hay St., Perth, and 397 Hannan St., Kalgoorlie.
- ATKINS (W.A.) LTD., 894 Hay Street, Perth.
- SOUTH AUST.: GERARD & GOODMAN LTD., 192-196 Rundle St., Adelaide.
- TASMANIA: W. & G. GENDERS PTY. LTD., 53 Cameron Street, Launceston, & Liverpool St., Hobart.
- LAWRENCE & HANSON (ELECTRICAL) PTY. LTD., 120 Collins Street, Hobart.
- NOYES BROS. LTD., 36 Argyle Street, Hobart.

Australian Factory Representatives: R. H. Cunningham & Co., 62 Stanhope Street, Malvern, Victoria. Tel.: UY6274.

NEW RADAR EYES FOR U.S. NAVY



A NEW US NAVY FLYING LABORATORY, a specially-modified Lockheed Constellation, is being readied to conduct extensive tests of the Navy's Airborne Early Warning radar equipment and procedures. The electronic equipment in the aeroplane extends the eyes of the Fleet for many miles over the horizon to warn of the approach of enemy air units. One of two such aircraft purchased by the Navy, this version of the Constellation transport provides a defence against both low and high altitude attack planes. Since radar waves from ship-borne sets are limited in that they cannot "see" over the horizon, powerful radar antennae located in the bulky external radomes on this high-flying patrol plane detect the approach of enemy units while they are still many miles beyond the horizon, permitting early interception by the Navy's carrier-based fighters. Test flights of the new aeroplane indicates that the external radomes do not materially effect the Constellation's oustanding flight characteristics.


RADAR & IDENTIFICATION
OWN INTERCEPTORS
INFORMATION TO CARRIER
SHIP'S RADAR BEAM
ENEMY BOMBERS
LOWER LIMIT OF SHIP'S RADAR COVERAGE
CARRIER

This diagram shows how the airborne radar set extends the range of interception by making use of height. There seems no reason why a number of such aircraft could not be used to give still greater range.

BARGAINS IN RADIO

RECORD CHANGERS

Admiral (made in U.S.A.). Will play 10-10 inch or 10-12 inch records automatically. An excellent job—robust in construction and beautifully finished in fawn crackle enamel. Easily worth £18/10/-, our price **£9/5/-.**

Stromberg Carlson. We have a few job Stromberg Carlson changers, similar to the Admiral, in good condition, for only **£10/15/-.**

Plessey (made in England). Will play 8 records 10 inch and 12 inch mixed. A good job with excellent tone and performance. A few to clear at **£11/10/-.**

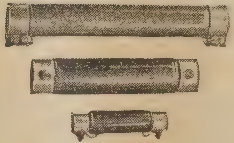
BETA FIT SETS

These engineering sets are ideal for the young boy interested in making models of Cranes, Windmills, etc. No less than 60 different models can be made with the No. 3 sets. They are specially reduced to be within the reach of all.

No. 1 Set. Was 5/11.
Reduced to **3/6**

No. 2 Set. Was 9/3.
Reduced to **5/6**

No. 3 Set. Was 14/4.
Reduced to **8/6**



WIRE WOUND RESISTORS

Wound on Porcelain and Porcelain enamelled over wire.

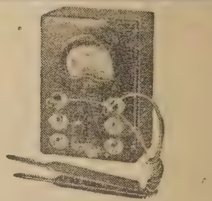
These are the finest resistors available; were made for British Navy, only a limited range is now obtainable as listed:—

Ohms	Watts	Tapping	Price
25	20	—	2/-
50	85	—	4/-
100	40	—	2/6
350	25 W	Movable	2/6
500	20 W	"	2/-
500	55 W	—	4/-
850	20 W	—	2/-
1000	85 W	—	4/-
1000	120 W	—	5/-
2500	20 W	—	2/-
2500	10 W	—	1/6
3000	60 W	—	4/-
4500	12 W	—	1/6
5000	20 W	—	2/-
5000	55 W	—	4/-
10,000	55 W	7,000	4/-
10,000	55 W	—	4/-
12,500	20	—	2/-
24,000	55	11,000	4/-
30,000	85	—	4/-
40,000	60	—	4/-
100,000	120	—	5/-

GRAMOPHONE MOTORS

Acos English motors really reliable and attractive in appearance, easily worth £6/10/-; our price to clear **£3/19/6.**

Audix English motors, a very good job with 12" turntable and unit plate. To clear at **£3/19/6.**



CHIEFTAIN MULTIMETER

The Ideal Pocket Size meter for measuring voltages of electrical circuits and checking continuity of circuits, etc.

Volts scales 0-15, 0-150, 0-300, 0-600, DC. OHMS, Scale, 0.50000. The cheapest and smallest on the market. Complete with prods and Battery. Can be carried in your coat pocket with ease.

Price £2/19/6.

METERS

Just the job for testing dry batteries, accumulators, electrical circuits carrying DC, etc.

Voltage Ranges 0-20.
0-200 Volts.

The meter used is moving coil and very accurate. This job is easily worth 35/-, our price **17/6.**

PLEASE NOTE!

All parcels will be sent registered post unless otherwise stated.

Postage must be included with order.

MOTOR SPARES LTD.

547 ELIZABETH ST. MELBOURNE.

NEWS AND VIEWS OF THE MONTH

Television News

TELEVISION continues to be in the news, and this month has seen further use of the medium in hospitals for extending audiences of nurses and doctors while operations are in progress.

The use of television in this form has been an excellent source of publicity for it, but it is hardly fair to imagine that the demonstrations have no other value.

Even though black-and-white television only has been used here so far in this connection, those who have seen it testify to its value. An almost unlimited number of people may be linked to the transmitter for this purpose, and, of course, they may be quite remote from the operating theatre, the length of co-axial cable being probably the limiting factor.

TELEVISION v. FILMS

There seems little doubt, however, that for the full capabilities of television to be realised for medical work, color will be essential. It is often the only way in which various tissues may be recognised one from the other. Black-and-white cannot give a really satisfactory contrast, a fact which has been clearly shown overseas where both systems have been used.

This, however, does not detract from the value of televised operations. The difference is largely one of degree, which will, no doubt, right itself when color is available.

An interesting comparison between filmed operations and the same thing televised has been made in reports from overseas, which highlights the more permanent nature of the film medium.

Color films made by specialists can be kept as a permanent record of performance and technique, whereas television is good only for a single performance. It is probable, also, that the perfection of film color is more advanced and more consistent than at present possible with television, although it is understood that the latest color television is quite comparable with film.

On the score of expense, too, it seems that films would have the edge, for the cost of television equipment, particularly if in color, is very high, and requires more manpower for its use and maintenance.

At the same time, we must applaud the enterprise of those responsible for these demonstrations here in Australia, as not only do they illustrate the possibilities of the medium for things other than broadcasting, but they are providing engineers with valuable experience for use when the day comes to radiate programmes from our own stations.

TELEVISION IN ENGLAND

Sir Ernest Fisk, managing director of EMI, who is now visiting Australia to further his company's interests in our television plans, draws attention to the good work being done by his company in England.

The extensive plans of the BBC in its erection of more high-powered

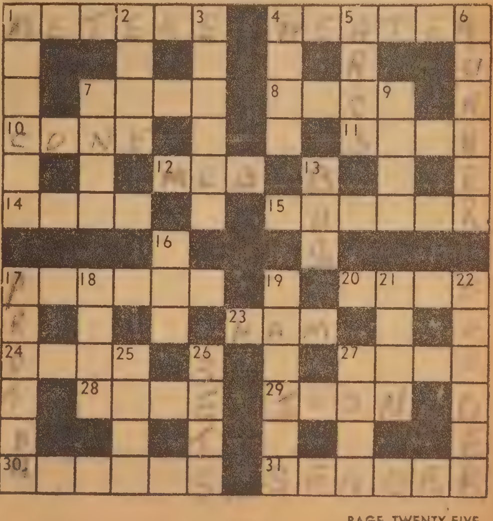
RADIO CROSSWORD PUZZLE, No. 30

ACROSS

1. Measuring instruments.
4. Filament.
7. Transmisison units in decimal system.
8. Type of balancing circuit.
10. Moving part of speaker.
11. Type of beam in television.
12. A million ohms (abbr.).
14. Type of ray.
15. Type of oscillograph.
17. Affect circuit by other circuit.
20. One or two equal parts.
23. Radio amateur.
24. Condenser end wire.
27. For carrying power.
28. ...... constant.
29. Soldering tool.
30. Transmission units in Napierian System.
31. Multi-purpose switch in receiver.

DOWN

1. Metal master in disc recording.
2. Lengthened.
3. Collection of principles.
4. Old type of speaker.
5. Portions of circles.
6. Sprinter.
7. Type of cathode rays.
9. Reverberation.
13. Automatic morse key.
16. Measurement of 45 inches.
17. Positive ion..
18. One.
19. Alkaline earth.
21. Related.
22. It carries current to antenna.
25. Tree.
26. Radios.
27. Records.

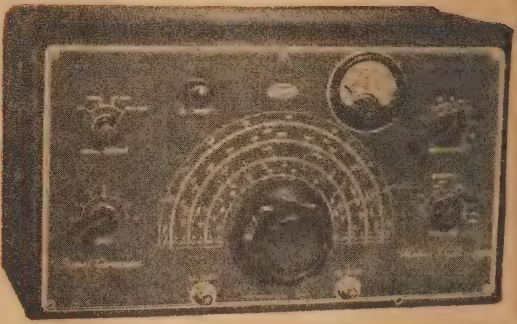


BELOW — LAST MONTH'S SOLUTION

D	I	R	E	C	T	■	■	F	O	C	U	S
A	■	A	■	O	■	H	■	■	■	O	■	Y
R	A	D	I	A	T	E	■	B	E	A	M	S
A	■	I	■	S	■	N	O	R	■	X	■	T
F	■	O	U	T	E	R	■	O	X	I	D	E
■	■	■	R	■	■	Y	■	A	■	A	■	M
■	C	O	N	E	S	■	I	D	O	L	S	■
M	■	E	■	T	■	P	■	■	R	■	■	■
E	A	R	T	H	■	L	U	M	E	N	■	T
T	■	S	■	E	T	A	■	O	■	O	■	U
R	O	T	O	R	■	T	E	N	S	I	O	N
I	■	E	■	■	■	E	■	E	■	S	■	E
C	O	D	E	S	■	■	B	L	E	E	D	S

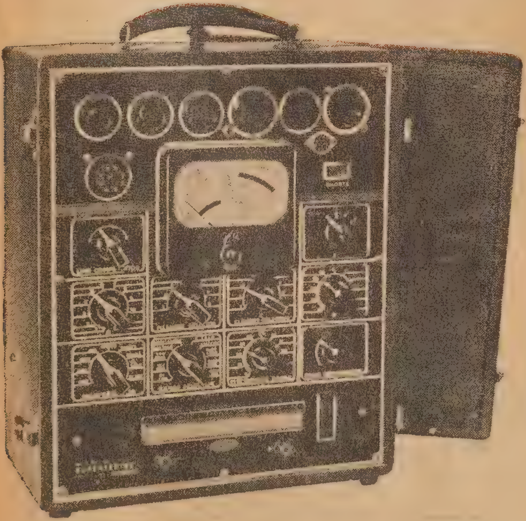
QUALITY TEST EQUIPMENT

University



SIGNAL GENERATOR—SGA

Here is a Signal Generator covering the extraordinary wide range of 150 Kilocycles to 100 Megacycles. A special and exclusive "University" feature is the Spot Tuning which enables all the salient points of receiver line-up to be run through without re-tuning. It incorporates a calibrated Piston Attenuator which reads from 1 Microvolt to .1 of a volt. Variable Modulation is a feature which enables a range from Zero to 100% to be selected. A standard dummy aerial is supplied and the Instrument is designed to operate from 240 volts A.C. Undoubtedly this is the finest Signal Generator manufactured by the well-known University Test Equipment Company and you are invited to write for further details.



SUPER TESTER—TST

Without a doubt the most efficient and up-to-date Valve and Circuit Tester in the Southern Hemisphere. The Model TST is a compact Instrument combining the functions of a Valve Tester, Multimeter, Output Meter, Paper and Mica Condenser Tester and Electroylctic Condenser Tester. An important feature is the time saving Roller Chart.

University

RADIO KIT SETS • RADIO & ELECTRICAL TEST EQUIPMENT

MADE BY UNIVERSITY GRAHAM INSTRUMENT CO., 5 North York Street, Sydney. Phone BU3169—2 lines.

stations has given EMI a chance to build some super-powered stations such as the one at Sutton Coldfield, pictured in our last issue.

In the design of these stations emphasis has been placed on two very important aspects of modern television—high aerial power and extreme aerial height, both of which are essential to extend the range of service, and give strong signals throughout the service area. It is generally recognised, too, that high power is probably the best method of attacking the noise problem, without doubt a major one to the television industry.

Much can be done to reduce the effects of noise, which show up as picture mutilations, by attacking the interference at its source. Unfortunately, some of this interference comes from other services operating on comparable frequencies, and the difficulties of suppressing harmonic radiation, &c., are not easy in this frequency region.

The stringent requirements of television as regards wide bandwidth might well require restrictions to such other services which are irksome to say the least of it, and might well be impracticable.

The procedure of radiating such a strong television signal that it can over-ride the weaker interference seems to be a sound one, and we should not overlook this point in our own plans.

ELECTRICAL INTERFERENCE

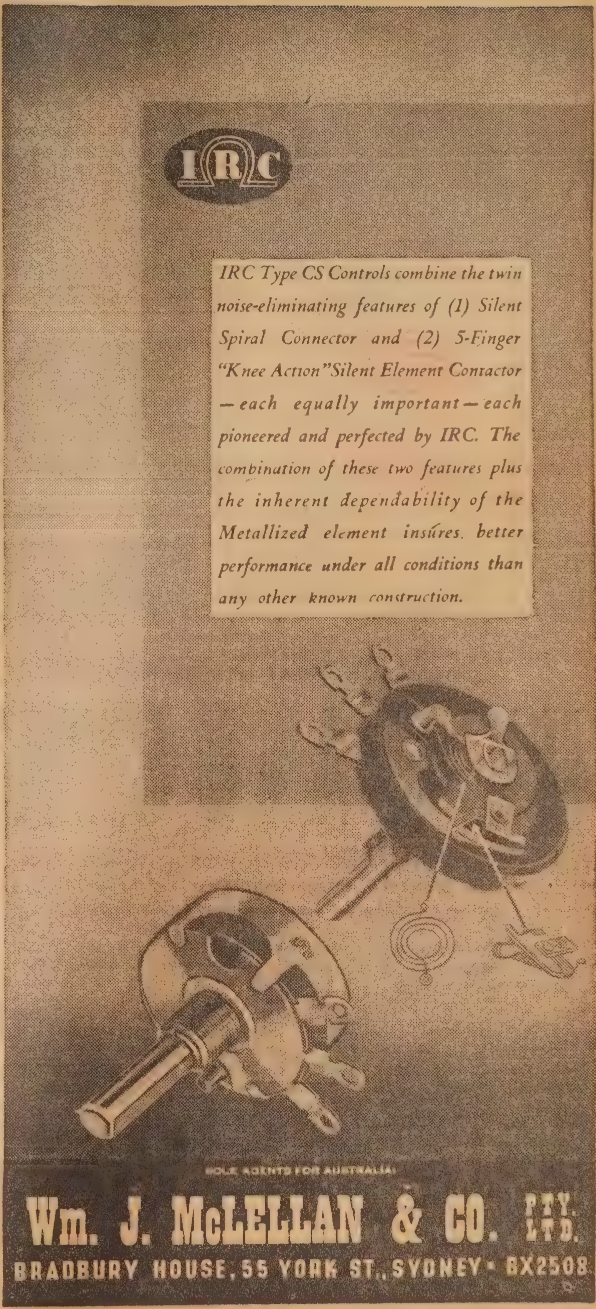
Interference from electrical devices will upset television transmission just as it will other transmissions, and the problems of its elimination, we would say, are unsurmountable. Moreover, someone must have the power to enforce the suppression of such interference, and as those who have been troubled with it on the broadcast band can testify, no one seems to have this power at the present time, nor could they satisfactorily silence the thousands of motors and other devices if they did.

IN AMERICA

Much the same thought seems to be working out in America, as evidenced by the almost completed super aerial erected at the top of the Empire State Building in New York, the highest man-made structure. This aerial is approximately 1500 feet above sea level, and is probably the highest of its type in the world

It is pretty safe to assume that when it is in operation its powerful signal will prove the most effective noise suppressor yet devised. Noise problems in America are exceedingly serious, and despite all the regulations in the world, their solution by normal suppression methods seem doomed to failure.

Paper-making originated in Japan and for centuries it was made from rags. In 1889 a factory in Oji began making paper from wood pulp, using fibres of indigenous plants. That was the commencement of an industry which has become worldwide.



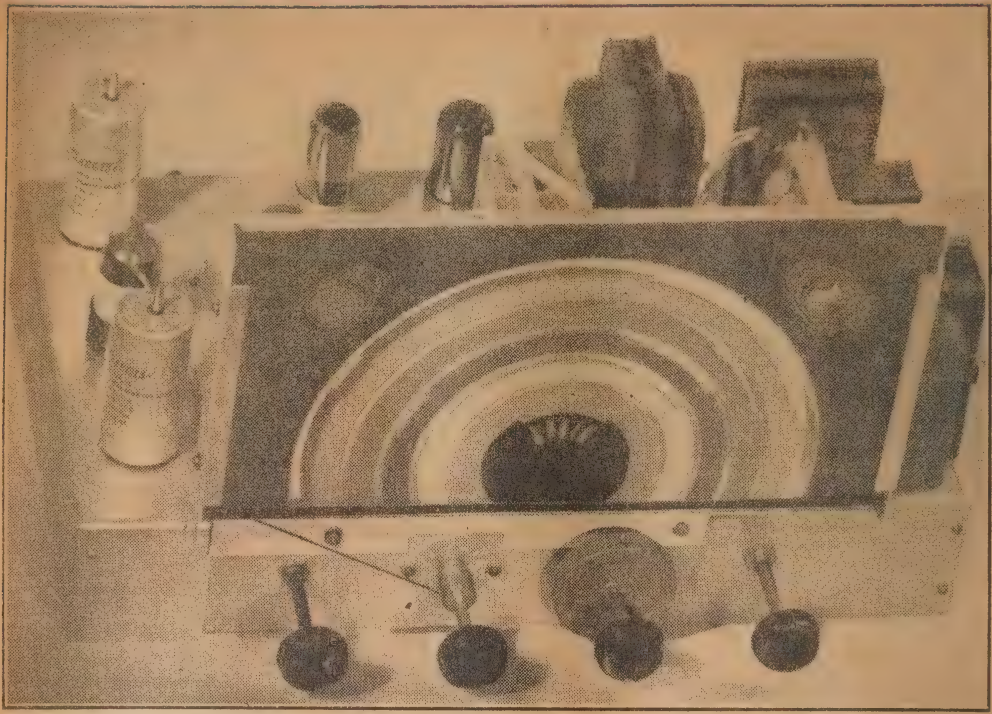
IRC

IRC Type CS Controls combine the twin noise-eliminating features of (1) Silent Spiral Connector and (2) 5-Finger "Knee Action" Silent Element Contactor — each equally important — each pioneered and perfected by IRC. The combination of these two features plus the inherent dependability of the Metallized element insures better performance under all conditions than any other known construction.

SOLE AGENTS FOR AUSTRALIA:

Wm. J. McLELLAN & CO. PTY. LTD.

BRADBURY HOUSE, 55 YORK ST., SYDNEY • BX2508



Controls left to right are—function switch, wavechange switch, tuning, volume control. The power transformer is at the right front edge with the two filter chokes in line towards the rear. Along the rear edge from the chokes are the output transformer, the 6V6-GT, the 6SJ7-GT with the IF valve and transformers down the left-hand side.

THE BANDSPREAD SIX

Five bands, six valves, bandspread tuning, variable selectivity—these are the features of this new set. Built around a commercially-available coil unit, this set will prove attractive to the average listener as well as the international short wave DX hound.

by Raymond Howe

SHORT wave listening has a great deal of attraction for many listeners and well to the fore in this large section of the community is the home constructor. He likes to be able to build for himself a set which gives to him most of the features which he likes, and to his family most of the things which they like. The family likes to listen to programmes on the broadcast band and, at spasmodic intervals, to delve into the variety of entertainment available on the short wave bands. He, himself, has a yen to do less of the former and more of the latter.

In this regard, he likes to have much the same ease of tuning as that on the broadcast band. This makes bandspreading in a set an attractive feature. The family likes it, too, as it reduces a lot of the fuss and bother which some persons attach to shortwave listening. For this same reason, the provision of a "magic eye" tuning indicator meets with the approval of all concerned.

The average radio-minded family man also appreciates the urge of his younger generation to play recorded music in the home, not to mention his own personal desire to do the same thing. Usually, the only difference is in the selection of the type of music.

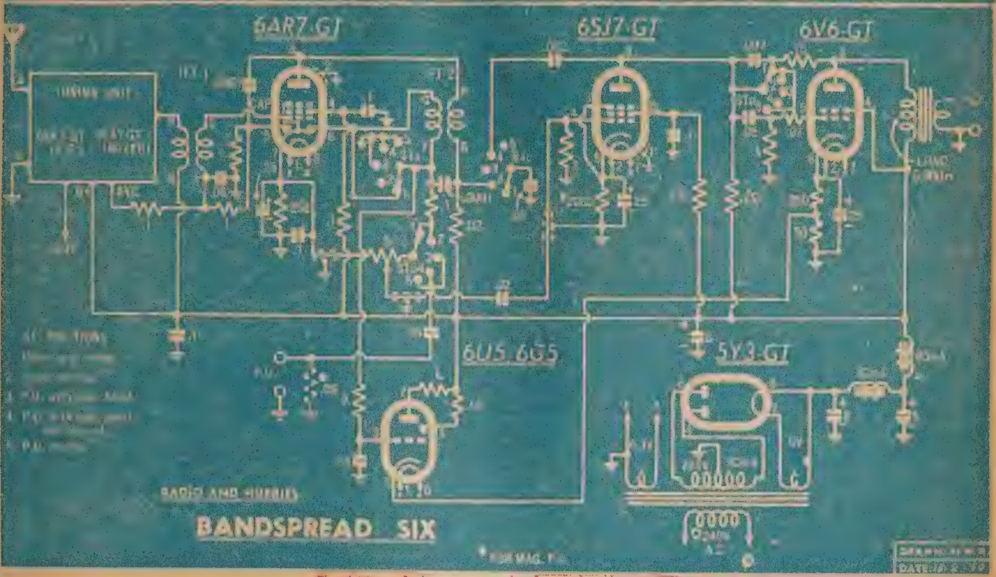
All of these features, plus a few others, are points which he likes to combine into one piece of apparatus so that all tastes are met with a minimum of financial outlay and electrical complexity.

It is with this idea in mind that this set came into being. It represents a not-too-costly approach to the personal problem of the typical home constructor.

In all, six valves are employed, including the rectifier. The electron indicator, commonly referred to as the "magic eye," is not being considered as a valve, as the set performance is not dependent upon its use. It is an optional fitment, like radio is to a car.

To give the bandspreading feature without adding to the complication of the set, use is made of a commercially available tuning unit marketed by a well-known manufacturer. This unit provides for five bands—the broadcast band and four shortwave bands.

VARIABLE SELECTIVITY FEATURED IN RECEIVER



Flexibility of the receiver is shown by the circuit.

The idea behind the design of this unit is to exclude most of the unwanted portion of the shortwave spectrum and retain that which can give some entertainment value. Accordingly, the first shortwave band covers 3·5 mc to 4 mc, taking the 80-metre amateur band. The second covers from about 5.9 mc to 7.5 mc, taking in the 49-metre band and the 40-metre amateur band. The third covers from about 9.4 mc to 12.3 mc, taking the 31 and 25 metre bands, whilst the fourth covers from about 14 mc to 18 mc, taking in the 20-metre amateur band and the 19 and 16 metre bands. This coverage is as marked on the dial, there being a little leeway at each end.

The whole unit, complete with dial and eschutcheon, is constructed on its own sub-chassis and comes completely wired from the aerial lead to the mixer plate lead to the first IF transformer. The only necessary additions are the valves. Recommended types for this particular tuning unit are the 6SK7-GT for the RF socket and a 6SA7-GT for the mixer socket.

THE I.F. STAGE

From the unit we fed into one stage of intermediate frequency amplification using the recently-released 6AR7-GT duo-diode-pentode. Here, in this IF stage, we introduced switching in the last IF transformer to give "wide" and "normal" audio range reproduction. The scheme is not new to our readers, and many constructors have acclaimed the facility as something they would not be without.

It is attractive by reason of its utter simplicity. Briefly, it consists of removing the last IF transformer from circuit and substituting in its stead resistance-capacitance coupling to the diode. Although this is not an ideal way of feeding a diode detector, the results obtained in "opening up" the audio reproduction are well worth any compromise introduced into detector efficiency. Actually the drop in output is about 6 db, but the available audio gain is quite sufficient to cope with this.

SWITCHING

The switching operation is carried out with a 2-pole 5-position 2-bank wafer switch, two of the four poles doing the switching of the IF transformer. In keeping with our usual terms of reference, we have labelled this control the "function" switch.

Reviewing its control of the circuitry, you will note that in position 1, which is "radio wide range," the wiring follows that of a standard IF stage with the exception that the .02 megohm resistor and the .05 mfd capacitor in the feed to the plate winding act as decoupling components. The .0001 mfd capacitor across the bottom of the windings bypasses RF to earth through the .05 mfd. In position 2, the diode winding of the transformer is shorted out, connecting the 0.1 meg RF filter resistor direct to the diode together with the .0001 mfd capacitor.

At the same time, the .05 mfd decoupling capacitor is disconnected from the bottom end of the plate winding.

The 0.5 meg diode load volume

PARTS LIST

- 1 Chassis 16½in x 10in x 2¾in.
- 1 Power transformer 285v a side at 80 mA, 6.3v and 5v windings.
- 2 Filter chokes, 80 mA (C15/80 or similar).
- 1 Output transformer, 5000 ohm to voice coil (OP1, OP54 or similar).
- 1 Multi-band tuning unit, type KC5.
- 2 455 kc IF transformers, Nos. 1 and 2 (J9 and 10 or similar).
- 1 2-pole, 5-position, 2-bank rotary switch.
- 4 Octal sockets.
- 1 4-pin socket.

VALVES

1 6SK7-GT, 1 6SA7-GT, 1 6AR7-GT, 1 6SJ7-GT, 1 6V6-GT, 1 5Y3-GT, 1 6U5/6G5 indicator (optional).

CONDENSERS

3 25 mfd. 40 pv. electros. 3 8 mfd. 525 pv. electros. 4 .1 mfd. 400 vw. tub. 5 .05 mfd. 400 vw. 1 .02 mfd. 2 .002 mfd. mica. 2 .0001 mfd. mica.

RESISTORS

2 2 megohm, 1 1.5 megohm, 3 1 megohm, 1 0.75 megohm, 1 0.5 megohm, 1 0.5 megohm potentiometer, 1 0.25 megohm, 3 0.1 megohm, 1 0.05 megohm, 1 0.02 megohm, 1 0.01 megohm, 1 250 ohm, 1 250 3 or 5 watt wirewound, 1 50 ohm.

SUNDRIES

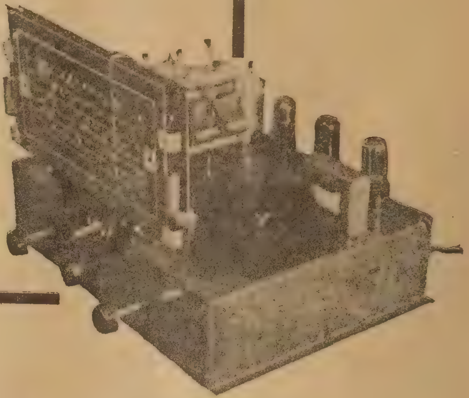
4 knobs, 4 terminals (2 red, 2 black), 2 dial lamps, 1 grid clip, approx. 7½in of ¼in dia. rod, 1 ¼in shaft coupling, 1 ¼in shaft bearing, scrap aluminium approx. 6¼in x 2½in for switch bracket and shield, 4 3-tag and 2 5-tag mounting strips, approx. 3½ feet shielded hook-up and suitable size spaghetti covering, power flex and plug, hook-up wire, solder, solder lugs, nuts, bolts, etc.

TWO WINNERS

A NEW

TRIPLE-SIX KIT-SET

with 67 pages of Building Instructions



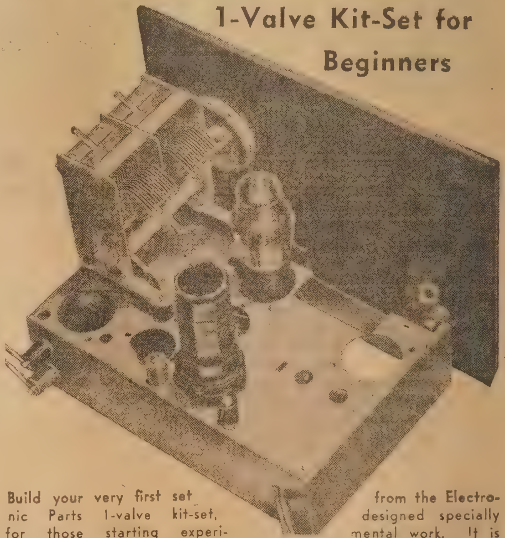
Yes, the building instruction booklets (in all 67 pages) for this superlative new 6 valve triple wave kit with R.F. stage will give you not only complete details of how it should be built, but will explain the operation of, and general radio engineering principles which underlie all radio receivers. Profusely illustrated with circuit diagrams, under chassis wiring diagrams etc., etc. This kit was designed by well-known radio engineers, especially for students and experimenters who wish to **learn** at the same time as they construct this highly-efficient radio set. The kit, which is for 240V. A.C. operation covers these wave bands, 13-49 meters, 42-100 and 180-500 meters (Broadcast band). It comes to you complete with valves Aegis triple wave coil unit, Efco dial. Rola 12" speaker and everything required to build the receiver, right down to the last nut and bolt. All parts are of the very best quality. Price £26/18/-. (Plus freight).

THE KIT-SET SPECIALISTS

If you are interested in kit-sets of any description, you are invited to send for our free Radio Kit-Set catalogue. Over 40 different Kit-Sets are listed including all well-known "Radio & Hobbies" circuits. Popular "R. & H." designs include "Little General," "Fireside 5," "Carry-Set," "New Year Radiogram," "Kar-Set," etc. etc. In addition several attractive kits of our own design are listed.

and the well known

1-Valve Kit-Set for Beginners



Build your very first set from the Electronic Parts 1-valve kit-set, designed specially for those starting experimental work. It is battery operated and designed for both Broadcast and Shortwave reception. Full details of coil winding, how to mount the parts, method of wiring, etc. given with every kit. Furthermore, this set uses a standard 4-valve chassis, 2 gang condenser, and modern dial which can be used in bigger circuits if you wish to to build them later on. It comes to you complete with valve, all material necessary to build the set and wire the coils, head-phones, batteries and everything right down to the last nut and bolt, for the exceedingly low price of £6/18/-. Postage in NSW 5/- extra —other States approx. 7/6

ELECTRONIC PARTS PTY. LTD.
E. S. & A. Bank Building
BROADWAY, N.S.W.
Phone: MA 1661

Send coupon for descriptive leaflet on this new 6 valver (circuit is included).

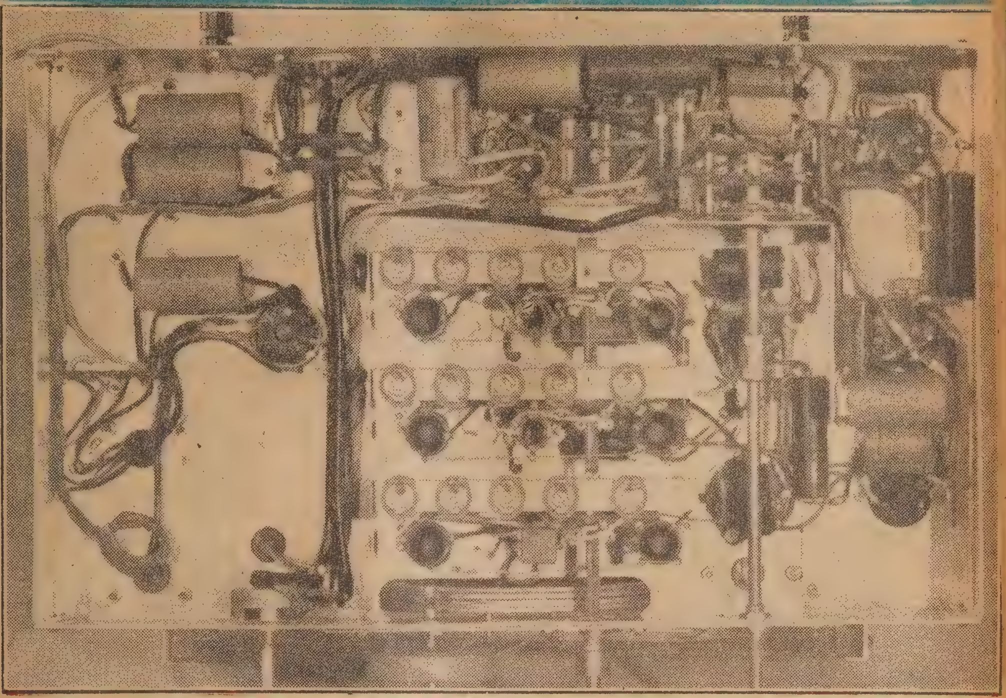
Name ....

Address ....

....

(Please enclose stamps to cover postage)

BANDSPREAD SIX UNDER-CHASSIS LAYOUT VIEW



The entire RF wiring is contained in the unit. Only the IF and audio sections plus power supply are to be built in the chassis. All adjustments are easily accessible. Note that the mounting bracket for the function switch is extended to act as a shield between the RF and IF stages.

control remains in the diode circuit for both positions.

The condition now is that the short across the diode winding heavily damps the plate winding and, to all intents and purposes, the diode plate is resistance-capacitance coupled direct from the plate of the IF amplifier pentode portion. The selectivity of the IF channel is considerably reduced, resulting in a much wider overall pass-band for the components of the audio modulation on the signal carrier wave.

WIDE RANGE

The change in the reproduction is unmistakable, and the added brilliance gives an audio response of the order obtainable with a TRF type of receiver. If you have not tried this scheme before we feel that you will be quite surprised not only with the result but with the ease with which it can be obtained. The handy feature is that it can be produced at will merely by flicking a switch. This selectivity control by switching allows the set to exhibit the selectivity of and behave in the same manner as a normal superhet with one stage of IF for those occasions when increased selectivity is required.

Because of the wider range associated with studio broadcasts, the wide-range position shows up better with them than when recorded programmes are being received. You may notice, too, that the tuning in this position is not as symmetrical as in the normal position. This is only a minor point, however, as the response is really "wide" in the wide position—enough to render it unimportant.

The audio end of the set uses the familiar 6SJ7-GT/6V6-GT combination which, for adequate output in almost any home, is difficult to beat. We measured an output figure at the primary of the output transformer approaching 4.5 watts. With a good quality output transformer you can expect about 4 watts at the voice coil of the speaker, and that represents a lot of noise.

The sensitivity figure at the grid of the 6SJ7-GT is of the order of 350 millivolts. This will accommodate almost any pick-up, with associated transformer where applicable.

THE CIRCUIT

Referring again to the wiring of the function switch, you will see that in positions 1 and 2, the 6SJ7-GT grid is driven from the diode circuit, the 0.5 meg volume control acting as the diode load resistor. In the switch positions 3, 4 and 5, the "hot" end of the volume control is connected to the pick-up terminals, thus taking the output of the pick-up to the grid of the 6SJ7-GT. In the same operation the detector diode plate is earthed, preventing any "break-through" of radio programme whilst the pick-up is being used.

The component values in the audio section are quite standard, although you will note that there is no RF bypass capacitor at the plate of the 6SJ7-GT. The point is that the length of the shielded hook-up necessitated by the positioning of the volume control effectively acts as an RF bypass capacitor.

FEEDBACK

Feedback is introduced between the plate circuits of the audio valves, the value of the resistor and capacitor being selected such that about 6 db of bass boost is provided for the pickup in the positions 3 and 4 of the function switch. Crystal-type pickups, which do not require additional boost, would normally be used with the switch in the position 5, where the bass boost capacitor in the feedback loop is shorted out. Position 5 of the switch is labelled "pick-up normal," to denote that neither bass boost nor top cut is used. You will note that this bass boost is shorted out for radio use also.

Summarising, for pickup use, the function switch provides "bass boost," "bass boost and top cut," and "straight" or "normal." To give the top cut in position 4, a .002 mfd capacitor is shunted from the plate

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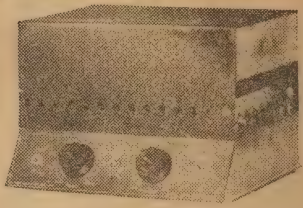

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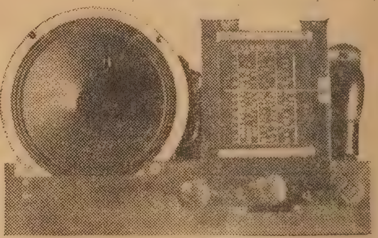

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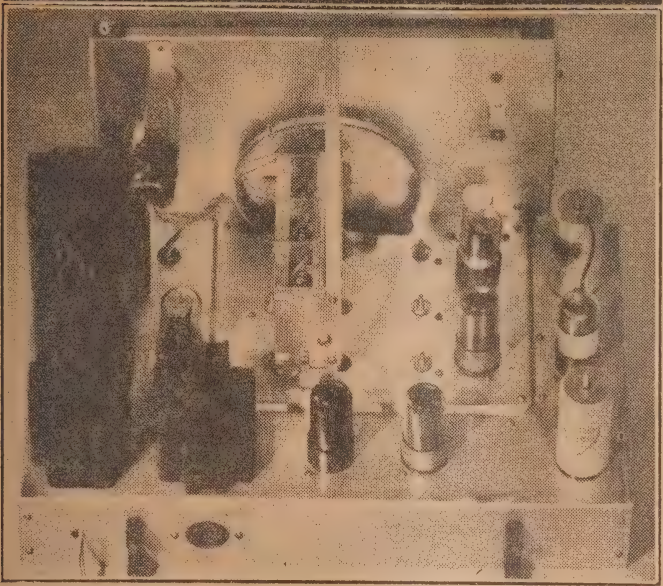

This picture shows clearly the unit construction of the tuning unit. The aerial and earth terminals are to the left of the speaker socket, the P.U. terminals to the right.

of the 6SJ7-GT to ground in series with the .05 mfd. The effective value of these two in series is very nearly that of the smaller one.

This shunt attenuation is far from the ideal way of limiting high frequency response because of the tapering characteristic; but, at least, it has simplicity to its advantage. The value of .002 mfd gives about 6 db "cut" at around the 5000-cycle mark. This is a fairly good compromise, although there is no reason why you should not vary this value to suit your own requirements.

POWER SUPPLY

Coming to the power supply, an 80 mA rating works out very nicely. In actual fact, we measured the drain under the maximum possible load as being 78 mA. This was with the audio end delivering maximum output under sine wave conditions and with the RF and IF operating under "no AVC" condition. In practice, the average current drain will be below this figure. We purposely overbiased the 6V6-GT slightly so that the total drain would be within 80 mA, although even with normal bias and no signal to the RF and IF sections, the total drain would hardly reach 85 mA.

The transformer secondary winding voltage of 285 each side appears as a d-c figure of about 270 volts after the drop in the rectifier and the two filter chokes in the double-section filter. You may think that the use of two filter chokes in the filter, instead of the customary one, is somewhat luxurious, but it is a wise precaution in the elimination of power supply hum, particularly where bass boosting is used.

Of course, the presence of hum depends to a great extent upon the bass response of your speaker system, and if it happens to be poor in this respect or is badly baffled, you may find that a good single-section filter is sufficient. Sufficient to say, however, that with the filtering used in this original set, there was virtually no hum evident with the set feeding into a large, expensive imported speaker mounted in an equally large vented enclosure.

In rounding off the comments upon the electrical design of the set, we come to the optional fitment, the electron tuning indicater. We used a 6U5/6G5 which exhibits a variable-mu characteristic in its indication. The controlling voltage is taken from across the diode load resistor through an isolating resistor of 2 megohms. The .05 mfd capacitor at the bottom of the 2 meg resistor filters out variations due to the varying amplitude of the modulating envelope.

MAGIC EYE

The grid of the indicator will assume the same standing potential as the point from which the controlling voltage is taken. With cathode bias applied to the 6AR7-GT, this point is approximately 2 volts positive with respect to earth and, hence, the cathode of the indicator must be taken to a point which is just slightly more than two volts positive with respect to earth. The most readily available point for this is in the cathode bias resistor of the 6V6-GT, a source which is steady irrespective of the setting of any control. Accordingly, the bias resistor is split into two components,

(Continued on Page 49)

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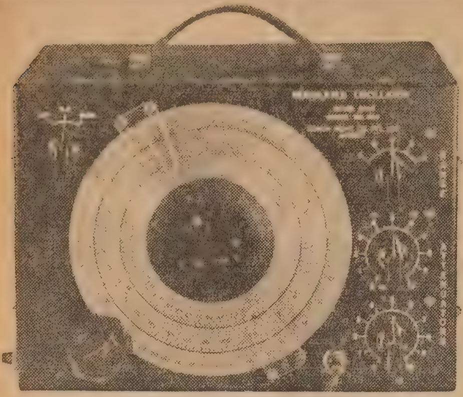

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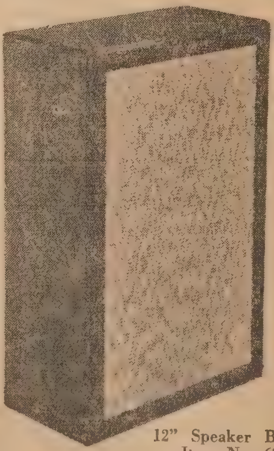

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A PREAMPLIFIER FOR WILLIAMSON

Since it was originally described by Mr. D. T. N. Williamson in "Wireless World," the high quality amplifier using triodes with feedback in the output stage has created considerable interest in Radio circles throughout the world. The design of the amplifier is such that it has a near perfect frequency response and negligible distortion. However, this improved performance introduces several new problems which requires special attention.

FOR full output the amplifier as originally described by Williamson requires an input of almost two volts. Therefore, when the amplifier is used with a high fidelity pickup or microphone, a preamplifier is required.

When an attempt is made to combine the good frequency response of the Williamson amplifier with high gain, low frequency oscillation, in the form of "motorboating," due to coupling through the power supply is likely to occur. A layout which allows unwanted capacitive coupling between stages can cause oscillation at very high audio frequencies or low radio frequencies. Many readers have experienced these troubles and therefore will be interested in the approach to preamplifier design made by Williamson.

PREAMPLIFIER

The circuits reproduced on this page were published in a recent issue of Wireless World. Fig. 1 shows the circuit of a simple preamplifier designed to couple a pickup to the main amplifier. Fig. 2 shows the response curve of the preamplifier when used with recordings cut to the Decca standard.

You will note that there is a high degree of attenuation below 20 cycles. Due to the simple circuit used there is some attenuation at 20 cycles but this is not serious in most applications. Actually, the attenuation is achieved by the combination of the .05 mfd coupling condenser and 2.0 meg grid return resistor.

Compensation at medium and high frequencies is achieved by a selective feedback network. Energy from the plate circuit is fed into the input circuit via a .004 mfd condenser in series with a .2 meg resistor. mfd condenser wired in parallel with the .2 megohm feedback resistor is included to compensate for the rising high frequency recording characteristic used by Decca. For E.M.I. records and most records available in this country, the condenser may either be switched out of circuit or omitted.

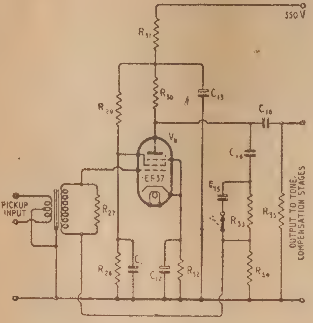
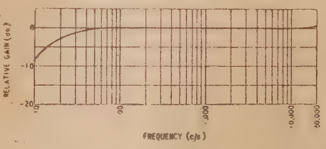
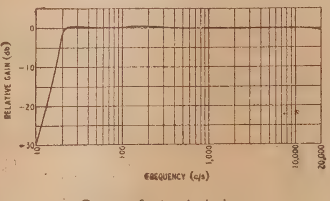


Fig. 1. Simple preamplifier designed for decca characteristics. C15 is switched out for EMI records



Curve of circuit above.



Curve of circuit below.

The extreme high frequency response of the preamplifier will be affected by excessive capacitance between the input transformer secondary and earth. With a well designed transformer the effect will be negligible. However, it is advisable to mount the input transformer on the preamplifier chassis in the interests of short leads. Other than the point just mentioned, the preamplifier is quite straightforward and presents no constructional difficulties.

VALVE TYPES

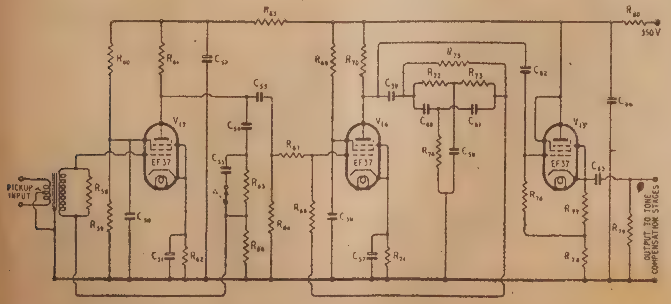
Incidentally, the EF37 has characteristics similar to type 6SJ7-GT, which may be used to replace it without modification to the circuit constants.

Fig. 3 shows the circuit of a preamplifier giving a very rapid 30 db/octave attenuation below 20 cycles. The first stage is similar to that of Fig. 1, while the second stage has a peaked response at 20 cycles due to a parallel-T network. The overall frequency characteristics of the combination are given in Fig. 4. This more advanced preamplifier unit includes a cathode follower stage to permit long leads between it and the following stage. The total gain is approximately 250 as compared with 11 for the simpler unit.

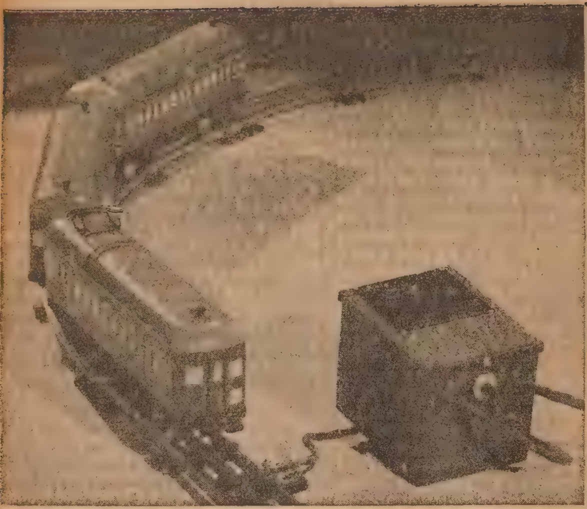
Errors in component values may seriously affect the performance of the latter preamplifier unit and it is not recommended that it be constructed by anyone not having adequate facilities to check the final result.

Williamson also suggested a tone compensation unit be connected between the preamplifier and the main amplifier. The tone compensation unit is provided with a separate power supply which also provides high tension for the preamplifier. This prevents low frequency oscillation due to coupling through the power supply. This is likely to occur despite the attenuation of the extreme bass in the preamplifier.

Our own solution to the problem was to retain the common power supply but use gaseous voltage regulator tubes to stabilise the high tension for the preamplifier. The circuit of a preamplifier along these lines was pubilshed in the December, 1949, issue of Radio and Hobbies.



The preamplifier circuit with high pass filter.



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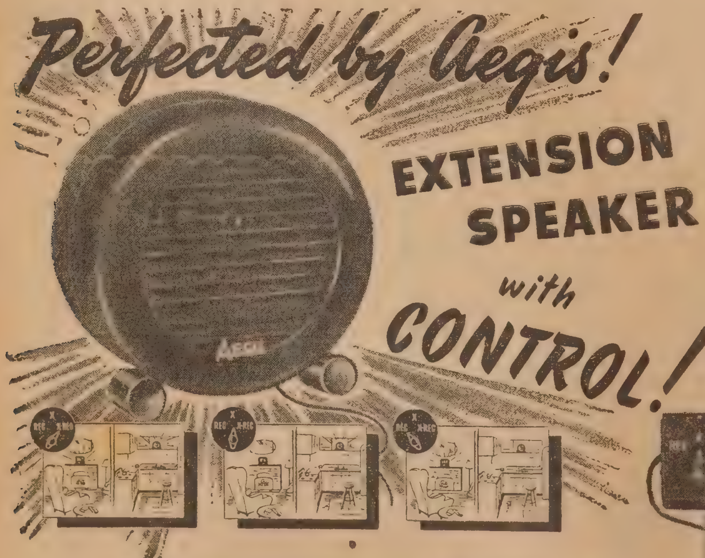

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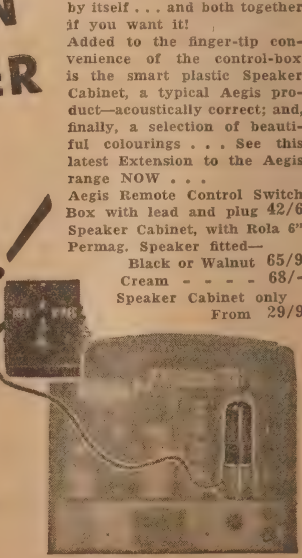

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WAR on flies has opened again over a wide front. First encounters between man and the hordes of his winged enemies have already taken place in the warmer parts.

Somewhat disturbing rumors have been going the rounds about DDT; that it has proven a failure through the development of resistant strains of flies; that it threatens national health by poisoning milk and other foods; that it is responsible for the advent of the mysterious "X" disease of cattle and "virus X" afflicting human beings. Two of these allegations contain some fact and some fallacy; the third one is fancy, pure and unalloyed. Both of these troublesome "X's"—which incidentally are unrelated — were known to science before DDT ever came on the market, so they could hardly have originated from it.

There is truth in the first statement: flies do continue to exist in communities where DDT has been used for a couple of years, and some of them are resistant to the action of the poison. That does not mean, however, that DDT has failed, or that wherever you see a fly in a DDT'd area it belongs to a resistant strain. Least of all does it mean that nothing can be done about such flies.

Presence of flies in places where DDT has been used may mean merely than people have been so naively confident of the kill-all powers of this relatively new weapon that they have neglected the use of older, less spectacular but still necessary methods of anti-fly fighting. It is still essential to cut the enemy off from his base of supplies by cleaning up all possible fly-breeding spots.

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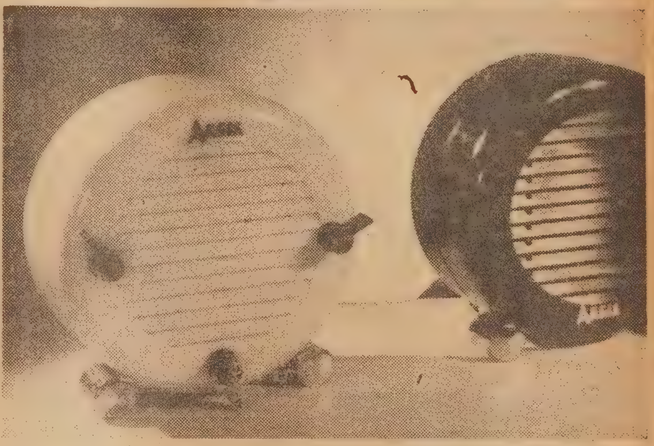

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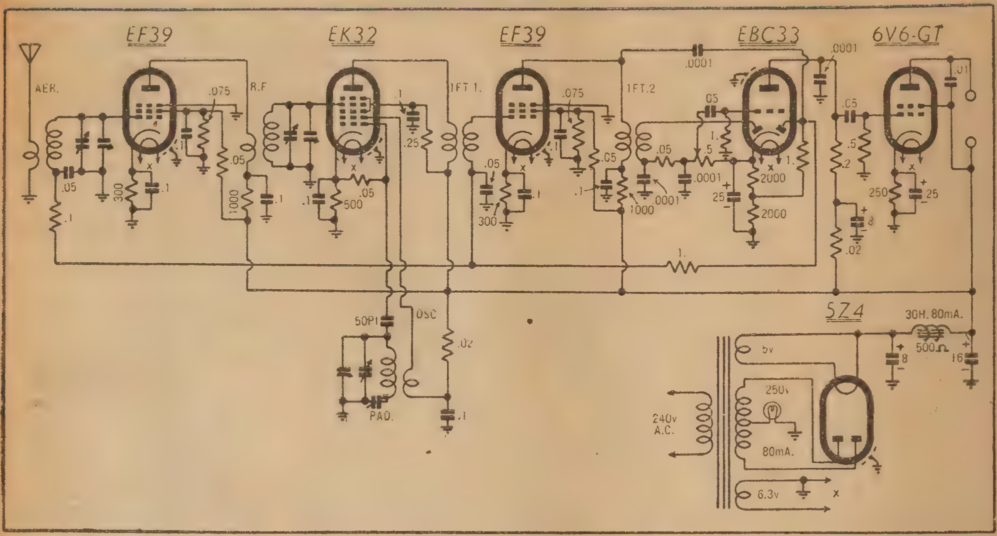


Another bracket of circuits, submitted for comment by our readers, suggests in the first instance a sound grasp of set design. The second effort reveals about as many basic errors as could exist in a four-valve design. But examine the circuits for yourself.

THE first circuit comes from a reader in Balmain, New South Wales. The valves were obtained almost entirely from disposals sources and the writer says he has incorporated all the refinements he can think of.

The circuit has been re-drawn by our draftsman, but no actual changes have been made. It is exactly as originally submitted.

There are no glaring faults in the design and, in fact, if built up as it is the set would work quite well. However, there are one or two things which warrant mention

SUPPRESSORS

The first thing we noticed was that the suppressor grids of the EF39 valves were connected to earth instead of to their respective cathodes. This would cause the grid bias voltage to be applied also to the suppressors, with a consequent slight reduction in gain. Although the loss of gain would admittedly be small, it is just as easy to return the suppressors directly to the cathode pins.

While on the subject of grid bias, let's take a look at the AVC circuit — in particular the cathode bias resistor for the EBC33 and the method by which delay voltage for the AVC system is derived.

As the circuit stands, the AVC line is returned to a point which is positive with respect to earth by one half of the voltage developed across the EBC33 bias resistor. This positive grid voltage would partially counteract the cathode bias applied to the RF and IF amplifier valves. To compensate for this it would be necessary to increase the value of the cathode bias resistors so that the voltage developed would equal the normal minimum grid bias, plus the amount by which the AVC line is positive.

In practice, however, there is no reason why the AVC line should not be directly earthed, making such compensation unnecessary.

We can see the reason for the mistake. If you look up the valve data book for the EBC33, the conditions listed give a plate current of 5 milliamps for a voltage of 250, with a grid bias of —5.5 volts. Now these conditions only apply where there is the full applied plate voltage of 250, such as in a transformer coupled stage.

PLATE VOLTS

When the valve is used as a resistance-coupled amplifier with the recommended plate load resistor of .2 megohm and cathode bias resistor of 4000 ohms, the actual voltage on the plate, assuming a 250 volt supply source, will be only 100 volts or so. Under these conditions the actual bias developed will probably be little more than two or three volts, which is quite normal as a delay voltage. The AVC line can thus be returned to earth, avoiding the complication of a positive potential at the grids of the AVC controlled valves.

While dealing with the EBC33, we would suggest the use of an RF bypass across the cathode bias resistor, in addition to the electrolytic condenser. This condenser is necessary to bypass RF voltages appearing across the cathode resistor, due to the presence of the detector and AVC diodes. Electrolytic condensers have poor characteristics at high frequencies, particularly when they age.

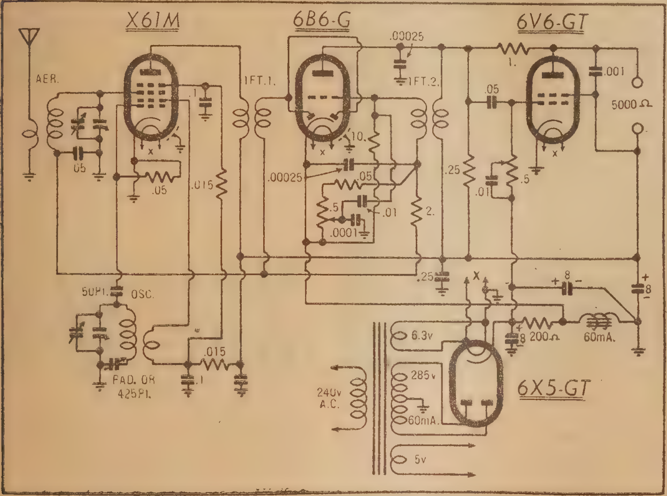
For this same reason we usually advise that a condenser of, say, .1 mfd be connected from HT to earth. In this set the best physical position for this condenser would be from the B-plus lug on the first IF transformer to earth.

SCREEN FEED

You will notice that our correspondent has used a separate pair of resistors to feed the screens of the RF and IF amplifier valves. While this method is perfectly correct, it is more conventional and often more convenient when wiring to use the one pair of resistors to feed both screens. The values of resistors to do this would be a 30,000 ohm 2 watt resistor from HT to the screens with a 50,000 ohm 1 watt resistor from the screens to earth. It is advisable with high gain tubes such as the EF39 to retain the two separate bypass condensers. With a lower gain tube such as the 6U7-G it is generally possible to dispense with the bypass at the RF screen pin.

Our final remark concerns the value of the bypass across the output transformer. This value of .01 mfd would appear to be a trifle on the large size and would cause severe high note attenuation. Of course, many may like it this way!

As an alternative, a standard high note cut tone control could be fitted to vary the treble response. There is hardly sufficient gain in the audio system to allow negative feedback to be fitted. The tone control could take the form of a .05 mfd 600-volt condenser and a .05 megohm potentiometer, wired as a rheostat, connected in series across the output transformer primary in place of the existing bypass.



The second circuit this month is from a reader in Sans Souci, New South Wales. Unfortunately this reader does not have a very clear idea of the basic requirements of a superhet and his circuit contains several fundamental design errors.

The circuit is apparently a modification of our "Universal Five," which appeared in the January, 1949, issue of Radio and Hobbies. It would appear that an attempt has been made to convert the set into a four-valve mantel job.

We will deal with the set stage by stage and explain the functions of each section as we proceed.

The first stage in the set is the frequency changer. The function of this stage is to select signals received by the aerial system and to combine them with a locally generated oscillation. This latter is so arranged that when the incoming signal is mixed with it a new signal emerges, the frequency of which is equal to the difference between the signal frequency and the local oscillator frequency.

This principle of operation allows a high efficiency single-frequency (or IF) amplifier to be used following the converter. It can give much greater gain and better selectivity than an amplifier which must be capable of operating over a wide band of frequencies.

The converter stage shown in the drawing is correct and is identical with that used in the "Universal Five." The .1 mfd condenser on B-plus is not necessary, however, because the HT line is already bypassed elsewhere with a 0.25 mfd condenser.

And now to the IF amplifier circuit:

As mentioned before, this amplifier works at a fixed frequency and can, therefore, be designed to give high gain and good selectivity with only one stage. It is in this stage that the first big mistake is made. Our budding designer has evidently tried to eliminate either the IF amplifier or the audio amplifier, combining the functions of both.

However, a glance at the circuit will show what the first IF transformer terminates at the diode detector Rectification will take place at the point and only a much-mutilated signal would be unable to pass on to the other stages of the set. Any audio output from the detector is effectively shunted out by the AVC bypass condenser.

It is not quite clear, really, whether it was intended to omit the IF amplifier or the audio amplifier. Either course can be followed but, to take advantage of the selectivity of the IF amplifier stage, small sets usually omit the audio stage.

I.F. AMPLIFIERS

To say the least, it is not good practice to use a triode as an IF amplifier. Quite apart from stage gain, the high grid-plate capacitance of the triode would certainly cause the stage to oscillate unless it were effectively neutralised. Then again, a high-mu triode such as the 6B6-G acquires a very high effective input capaci-

(Continued on Page 85)

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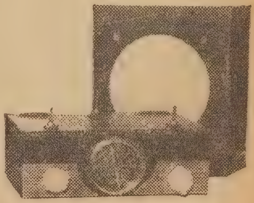

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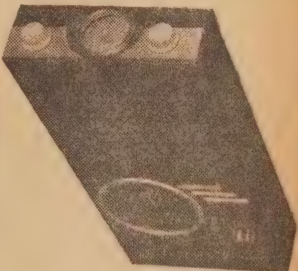

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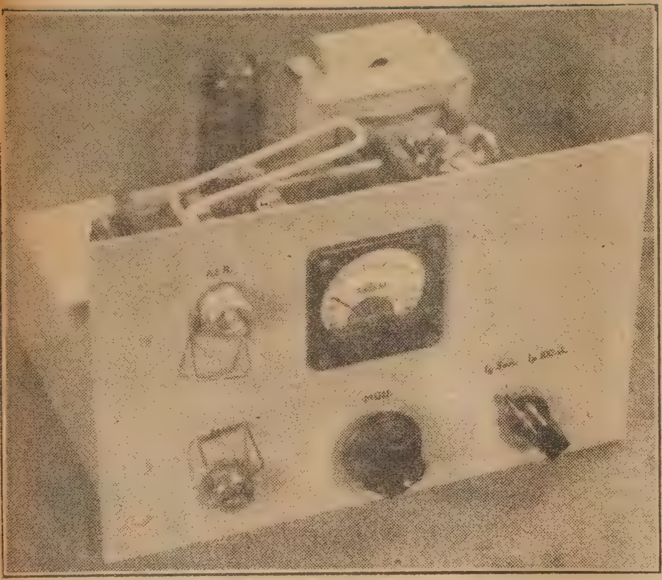


The transmitter is small and neat—the same size physically as the receiver described last month. Built from easily obtainable disposals equipment, its cost is quite low.

TRANSMITTER FOR 288 MC

A companion to last month's simple receiver, this transmitter will cost most amateurs next to nothing to construct. It radiates a very stable signal, and is an excellent proposition for VHF cross-town contacts.

by **W. N. Williams**

AS we pointed out last month, crystals and superhets have become the order of the day on 50 and 144 Mc., leaving the 288 Mc. band as the obvious choice for those who wish to operate on the higher frequencies without going to a lot of expense.

Properly built and adjusted, simple equipment of the type we are describing can provide excellent contacts between reasonably situated locations. Beam aerials are of such dimensions that they can be knocked together in a couple of hours and tied to a handy post or chimney. A gain of up to 9 or 10 db. can be realised quite simply at each end, greatly increasing the strength of signals.

SIMPLE EQUIPMENT

While VHF activities have, to date, been concentrated mainly in the capital cities, simple equipment should appeal also to any small group of amateurs in the country towns. Quite apart from the opportunity to become familiar with VHF techniques, it is possible to conduct cross-town QSO's without half the world listening in. Duplex operation is still another story.

As in the case of the receiver, an excursion into the higher frequency regions limits the choice of valve types. Even with the smallest feasible circuits external to the base, many valves will not even oscillate at 288 Mc., due to the amount of internal L and C. Other valves operate so grudgingly, and with such low efficiency that they also have to be ruled out of the picture.

VALVE TYPES

As a result of war disposals activities, several valve types have nevertheless been available to amateurs, which will work quite well at these frequencies. Invariably they are types employing miniature construction or, at the very least, very short leads to grid and plate.

A good VHF tube ideally has short leads to all electrodes, but, in practice, it is usually possible to get round the difficulty of one long internal lead (grid, plate or cathode), provided the other two are very short.

Considering both availability and price we selected the 7193, otherwise known as the 2C22. Introduced as an emergency measure during the early part of the war, it has an electrode structure very similar to the familiar 6J5, but has top-cap connections for both the grid and the plate. The particular attraction from the amateur's point of view is that they have been sold freely for about five shillings each, and are still available at the time of writing.

Published ratings show a maximum plate voltage of 500 ICAS or 300 for continuous commercial service. Plate dissipation is 3.5 watts and the heater rating is 6.3 volts at 0.3 amp.

Typical operating conditions as a class C amplifier-oscillator provide for 330 volts on the plate at 20 milliamps. Grid current is 2.0 milliamps and voltage—30, making the optimum grid resistor value 15,000 ohms. Approximate driving power is 0.2 watt and the R.F. power output 3.5 watts.

No information is to hand covering the relationship of ratings to frequency, but the natural resonance of the valve's input circuit is given as 335 Mc.

Heater and cathode connections are the same as for the 6J5, while the grid and plate connections to the top caps can be traced by inspection.

Our suggested transmitter uses two 7193 valves with a linear tank circuit and separate resonant chokes in the cathode returns. Grids are tied together.

PUSH-PULL CIRCUIT

The symmetrical push-pull arrangement not only doubles the power rating of the transmitter, but it renders the whole oscillator largely independent of chassis earth returns. Plate, grid and cathode circuits are all virtually floating, their "earthy" or mid-points being established by the natural balance between the elements and the electrodes. Symmetry is, therefore, most important in the construction.

FREQUENCY CONTROL

The plate lines were made from quarter-inch outside diameter copper tubing, spaced three-quarters-inch centre-to-centre. To form the closed end, two "V" sections were cut from the tube, just under an inch apart. The tube was then bent at right angles at these points and soldered to produce two rigid parallel Lecher bars spaced three-quarters of an inch centre-to-centre.

We made them five inches long overall, representing a length which could conveniently be accommodated on the chassis. We could only guess at the ultimate length, of course, since it would be affected by then unknown quantities in the valves themselves.

The actual frequency is controlled by a shorting bar, which was made up from a scrap of three-eighth-inch by a quarter-inch brass rod. This was first drilled with two quarter-inch holes spaced the same distance as the Lecher bars. A small hole was then run through the opposite face, between the two quarter-inch holes and at right angles to them. A hacksaw cut through the centre turned the device into two saddles, fitting one above and one below the Lechers. Enlarge the hole in one saddle, tap the other eighth whitworth, fit a suitable screw and the shorting bar is complete.

Its final position was rather closer to the valves than indicated in the photograph. To produce a frequency of 288 odd Mc we had to set it so that the face of the shorting bar was 3¼ inches from the plate caps. This distance included the flexible braid.

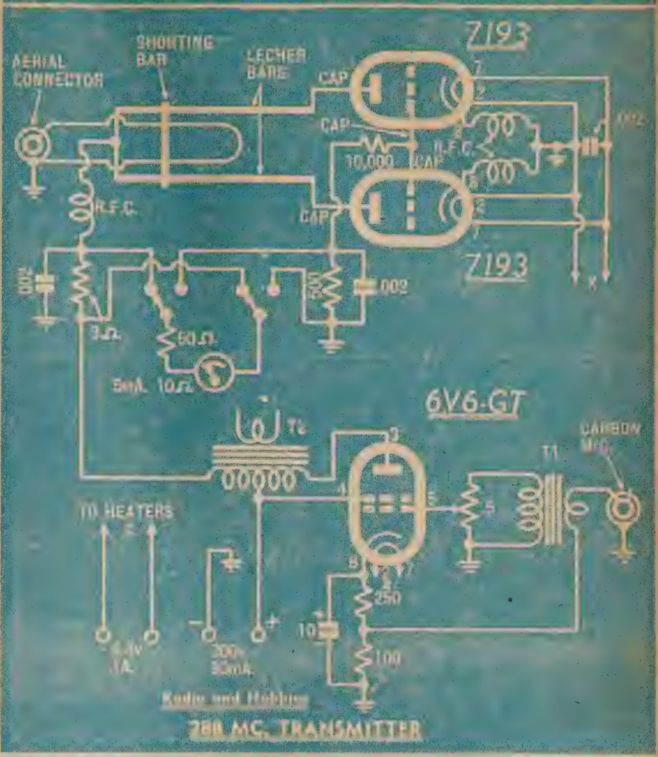
The bars were supported about 1¾ inches above the chassis on blocks of low-loss bakelite, which originally came from some British Admiralty transmitters. Connection to the grids and plates is made by copper braid no longer than actually necessary. You will be able to solder directly and neatly to the copper tubes if the open ends are cut away to a hollow spoon shape.

The grid resistor mounts on a strip close to the grids, the return lead dropping down through the chassis to the metering circuit.

AERIAL COUPLING

One other item of note in this portion of the circuit is the coupling loop to the aerial. The loop in our case was made from 14 gauge tinned copper covered with nylex or similar tubing. The ends running to the aerial socket are run side by side and enclosed in another larger sleeve to hold them together. The respective ends are then simply sweated to the aerial socket, one on the "hot" lug and the other on the "earthy" lug.

CIRCUIT OF 288MC TRANSMITTER



The circuit is extremely simple. Mechanical rigidity is most important. Do not overdo aerial coupling.

Ultimately, the amount of aerial coupling must be subject to experiment, but we found that a loop measuring about three inches by three-quarter inch was satisfactory, mounted in the position shown by the photograph. Once the optimum position is established it is a good idea to fix it solidly in place with some kind of extension from the Lecher mounting pillars.

This whole section of the assembly should be rock solid and a few hours' work making rigid plate lines and support pillars will be repaid by an unwavering signal. On several occasions, in the course of tests, we let the original transmitter run for periods of more than an hour, carrying tone and an occasional identifying signal. A superhet receiver 15 miles away registered strong signals all the while, with no apparent drift or variation.

CHOKES

The chokes in the 7193 cathode circuits should be broadly resonant around the operating frequency, although in practice a shift of 20 Mc. either way makes little difference to the feedback and the grid current. Wind 10 turns of 17 gauge enamel round a pencil, and you can be pretty sure that the total cathode circuit inductance will be right.

The choke in the plate circuit can be of much the same dimensions, perhaps a trifle larger, although it is not at all critical. The one which you can see in the photograph was another "prize" from a piece of Admiralty equipment. It has 20 turns on a ¼-inch bakelite rod, provided very conveniently with terminating lugs and a mounting screw.

METERING

Some form of metering is essential, at least for setting up the circuit. The grid current will be from 2 to 4 milliamps for the two tubes, and the plate current from 30 to 40, depending on exact operating conditions. You can install jacks and use external meters or buy shunts and a standard 1.0 milliamp movement if you are more affluent.

In the original transmitter we used a very simple but effective scheme, involving one of the popular ex-disposals 5-milliamp movements. One set of resistor values are given, but you can work out others to suit yourself.

The resistance of these movements is usually about 10 ohms but, to swamp out slight variations therefrom, we connected a 50 ohms resistor permanently in series, bringing the effective meter resistance to approximately 60 ohms.

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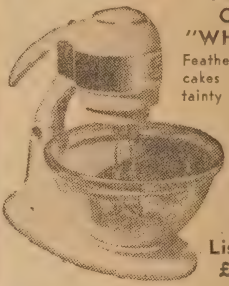

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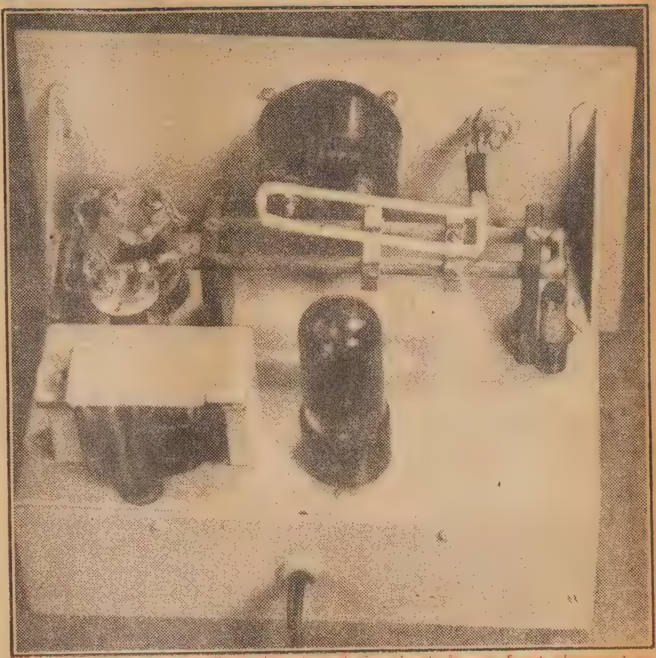
PLAN VIEW OF THE CHASSIS



This picture gives an excellent plan view of the chassis layout. Exact placement is not important but it must be a stroug mechanical job.

Now, to measure plate current on a 100-milliamp range, the shunt resistance has to be one-nineteenth of 60, or 3.13 ohms. We settled for a standard 3-ohm resistor and found that the discrepancy was negligible. Alternatively, an 85-ohm series resistor and a 5-ohm shunt can be used, or a 100-ohm series resistor and a 6-ohm shunt. All are near enough for practical purposes. The shunt is simply wired into the plate circuit and the meter switched across it when a reading has to be taken.

In the grid circuit, the 5 milliamp range is adequate, and no deliberate shuntings is required. A 500-ohm resistor is simply wired into the circuit to maintain a d-c path, the meter being introduced when it is desired to read grid current.

Note that one side of the heater is earthed at the 7193 sockets, the other side being bypassed with a .002mfd. condenser. There is no particular point about this value, here and elsewhere in the circuit. We happened to have a few condensers on hand, but any mica condenser from .001 mfd. upwards should be just as satisfactory.

POWER SUPPLY

The power supply can be quite a modest affair, the requirement being 300 volts at a nominal 80 milliamps. A standard 285 volts transformer, 5V4-G rectifier and a low resistance filter choke should produce just the required voltage, with 8 or 16 mfd. condensers fore and aft.

This same power supply could be used for the receiver described last month with, perhaps, an additional condenser and a resistor from 500 to 1000 ohms, providing extra voltage drop and filtering. It should not be a difficult matter to arrange a suitable system of plugs and switching to divert the H.T. supply to either receiver or transmitter to satisfy send/receive requirements.

Individuals may, of course, prefer to use separate power supply for the receiver, as suggested last month. Experienced amateurs should have no difficulty in making suitable arrangements along this line.

Having provided the necessary power equipment and switching the next job is to test and adjust the transmitter. The procedure is somewhat different from the usual exciter-amplifier rig.

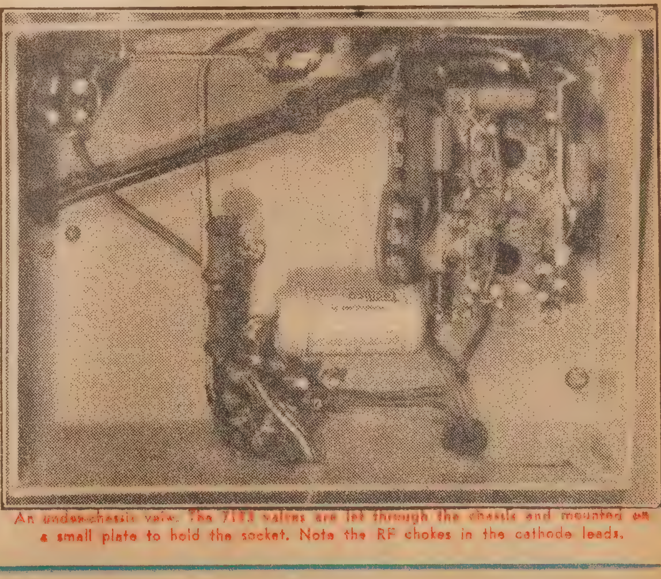
From ratings, it is apparent that the plate current must not exceed 40 milliamps and the grid current 4.0 milliamps for the two valves.

GRID CURRENT

When the transmitter is switched on, it should oscillate immediately, irrespective of frequency, the oscillation being indicated by a flow of grid current. The grid current will be maximum when the cathode chokes are near resonance and when the plate circuit is unloaded. For preliminary adjustments the plate circuit should be loaded with a 3.5 volt torch cell connected to a hairpin loop, measuring about 2½in x ½in.

With the loop close to the plate lines, the globe should light quite brightly. The globe absorbs some of the power, which would otherwise be dissipated in the tube, and reduces the grid current to roughly what it will be under loaded conditions.

If, under load, the grid current is



An under-chassis view. The 7193 valves are let through the chassis and mounted on a small plate to hold the socket. Note the RF chokes in the cathode leads.

A TRANSMITTER FOR 288 MEGACYCLES

obviously excessive, it can be backed off by varying the number of turns on the cathode chokes, thus throwing them off resonance. This should not be necessary, however, in the transmitter described.

The actual plate current will not change much under load, the variation being no more than a few per cent. R.F. power, which is not absorbed by the load, goes back into the grid anyway, and there is no sharp resonant dip, as in the case of a class C amplifier.

While the plate current must be watched to avoid excessive dissipation, the grid current becomes the real measure of loading. Obviously, the more heavily the plate circuit is loaded, the lower will be the grid current. Our own transmitter showed a maximum unloaded grid current of 4.0 milliamps, dropping to about half this under typical loaded conditions. Plate current came out at just under 40 milliamps at 300 volts.

FREQUENCY CHANGE

The frequency can be varied by sliding the shorting bar along the lines. The adjustment is quite critical and the best technique is to polish the lines first, then tighten the bar until it does not quite lock into place. It can then be tapped back and forth with an improvised mallet and a lining tool.

It would be possible to instal a tuning condenser similar to the one in the receiver, but, once set, it should not be necessary to keep altering the transmitting frequency.

Having got the transmitter into the band (288-296 Mc.), couple the aerial and prepare for the final adjustments. Watch the grid current and, if possible, have someone listen at a remote location, reporting back as adjustments are made.

Tightening the aerial coupling will reduce grid current as more and more energy is fed to the aerial. However, a point will be reached where reduced oscillator efficiency will overtake any advantage of tighter coupling and also where the aerial circuit will begin to "pull" the operating frequency rather drastically. The idea is to tighten the coupling long enough to strike an optimum balance between output and stability.

MODULATION

The modulation can then be advanced and also set by listening tests. Recognising that some frequency swing will be inevitable, must really be set to suit the type of receiver being used.

A super-regen. receiver, with its broad characteristic and high noise level, will take plenty of modulation for best results. A superhet, on the other hand, with greater selectivity and lower noise, will give best results with much lighter modulation.

Fortunately, providing amplitude modulation for an oscillator of this size does not present much of a problem. Realising that the limit of audio power is around 30 to 40 per cent of the d-c input and that this is under speech conditions only, we can see that a single 6V6-GT will do the job. Furthermore, with an eye to maintaining simplicity, it is desirable to drive the grid of the 6V6-GT direct from the microphone, hence the use of a carbon type and its associated step-up transformer.

The exciting voltage for the "mike" is readily obtained by tapping into the cathode bias resistor of the modulator valve. Although the price of a torch cell is about the same as that for the extra resistor required, this method does remove for all time the need to worry about checking the cell voltage at intervals and avoids switching to disconnect the battery from the "mike" circuit when not in use. Resistors, of course, are one component which the average amateur has in reasonable abundance.

For the modulation transformer, almost any push-pull speaker transformer will do, provided that it is capable of carrying 40 odd mA. Connected in the manner shown in the circuit diagram, the primary winding acts as an auto-transformer with a ratio of about 1 to 1. The unused secondary winding can be coiled up out of the way but make sure that any bare ends of this winding do not short together, otherwise a lot of audio will go to waste.

GAIN SETTING

The setting of the gain control for adequate modulation level will depend largely upon the sensitivity of your particular microphone. We found that with an average "mike," speaking a few inches away from it and with the control advanced near full on, the level was just about right. However, as mentioned before, be prepared to adjust the level to suit the type of receiver being used at the other end.

To amateurs located outside the region of existing 288 Mc activities, finding the band may be something of a problem. If a 144 Mc transmitter is available, the receiver can be tuned first to the harmonic, then used to set the frequency of the transmitter. If necessary, Lecher lines can then be set up to discover the approximate limits of the band.

As we mentioned briefly last month, it is absolutely essential to use a resonant aerial system at 288 Mc, with an appropriate method of feed. The simplest arrangement, of course, is a dipole, but, with a resonant half-wave at under 20 inches, it is a simple matter to provide a small array and realise several decibels of "free" gain.

AERIALS

Two half-waves in phase vertical is an excellent choice, although the writer has been using a wide-spaced three-element beam. The main run is in 70-ohm coax cable, which feeds into a three-quarter wave 50-ohm section, transforming the line impedance to about 35 ohms. This, in association with a quarter-wave balancing section, feeds the centre of the driven element.

An article on aerial arrays appears elsewhere in this issue and can be studied to advantage by anyone planning to build and use this little transmitter.

For aerial changeover, some form of coaxial relay or switch is to be desired. Ordinary switches and relays are often used for the purpose on the low frequencies, but very serious discontinuities can be introduced at VHF by compromise methods. But this, too, is really another subject.

The Genius of Albert Einstein

(Continued from Page 15).

of motion from them—then, considered together, they are essentially poorer in energy than was the original atom. The relative difference of the two is on the order of 1/10 of one per cent.

"Using a rich man as an illustration the atom M is a rich miser who, during his lifetime gives away no money (energy). But in his will he bequeaths his fortune to his sons M' and M" on condition that they give to the community a small amount, less than one thousandth of the whole estate (energy or mass). The sons together have somewhat less than the father had (the mass M' and M" is somewhat smaller than the mass M of the radioactive atom). But the part given to the community, though relatively small, is still so enormously large (considered as kinetic energy) that it brings with it a great threat of evil. Averting that threat has become the most urgent problem of our time."

The above statement of Einstein can be appreciated all the more when it is realised that of about one pound of Plutonium used in the bomb which destroyed Hiroshima only about 1/100 of an ounce of the total mass represented the energy which razed that city to the ground with most of its inhabitants.

To relate it to Einstein's statement the total weight of the split fragments of the bomb was 1/100 of an ounce less than the original mass. This difference was the energy released.

We would do well to ponder the final sentence in Einstein's statement "averting that threat has become the most urgent problem of our time."

AN INTRODUCTION TO V.H.F. AERIALS

The importance in the future of very short waves for communication broadcasting and television highlights the need to understand more about the problem of aerials for use at these frequencies. This article provides a summary of elementary aerial design, with special reference to the requirements for the 288 mc equipment now being described in our pages.

By JOHN MOYLE

WE all know that it is important to have the R.F. circuits in a radio receiver tuned accurately to the desired frequency for best reception of a station. If we can arrange for the aerial circuit to be tuned in similar manner it will be a much better "picker-up" of signals than an odd length of wire, although unfortunately the size of such an aerial for broadcast reception rules out this possibility in all but special cases.

An exception to this rule is the loop aerial as seen in a portable set. This is really the first tuned circuit in the set, made large enough to act as an aerial. Its physical magnitude is much less than that of a piece of wire, but, because it is resonant at the desired frequency, it is able to do a job out of all apparent proportion to its size.

TUNED AERIALS

It does serve to illustrate the principle, however, of tuning an aerial system wherever possible to get best reception.

The need for a tuned aerial is more urgent in the case of a transmitter. Unless the aerial is resonant, radiation from it will be inefficient to a serious degree.

Now, the smallest length of aerial which is naturally resonant is equal to half the wavelength with which we are concerned. Quarter-wave aerials are often used, and even eighth-wave aerials, but in all cases arrangements are made to make up the difference so that electrically the aerial system is equal to a half-wave length, although this made-up portion does not actually radiate. We don't want to get mixed up at the moment in the whys and wherefors of these aerials.

HALF WAVELENGTHS

The point is that, when we consider short waves, the half-wave dimension scales down in proportion to useable lengths. At 20 metres this is about 33ft, and at two metres about 3ft 4in. In the first case, wire aerials are easily strung up of the required length, and even metal tubing arranged as discussed later into beam aerials are not too hard to construct. At the wavelengths used for television, and for some of the amateur bands, it is quite simple to handle the half-wavelength dimension. Consequently, the use of resonant aerials is a logical step, and is universal for receiving as well as for transmitting.

The reason why a half-wavelength is resonant makes an interesting technical study beyond the scope of this article. Broadly speaking, any length of wire has the properties of inductance and self-capacity which are the essential elements in the formula which determine its resonant frequency. Whether we wind the wire into a coil or string it out in a straight line doesn't affect the principle, although the amount of wire used in each case need not physically be the same length. They are both tuned circuits resonant at the frequency for which we have designed them. In the case of the coil, we desire to restrict the fields round it in the interests of stability, and even enclose it in a metal can. In the case of the aerial, it is the interaction between the fields of the aerial and the signal radiated from the station which determine its efficiency for reception, and therefore we aim to make full use of its unrestricted field by erecting it well into the air where it is not shielded by anything.

Upon this general basis, therefore, we can now consider aerials for very short waves. All the following remarks apply equally to transmission and reception, for, according to the reciprocal theorem, the reception characteristics of an aerial are similar to those for transmission.

ACTUAL LENGTHS

The actual length of a half-wave aerial is less than the calculated length due to what is known as "end effect." For a wire aerial the reduction is about 4 per cent, and for a tube aerial of one-inch diameter about 6 per cent. In practice, however, 4 per cent is satisfactory for tubing up to ¼-inch in diameter.

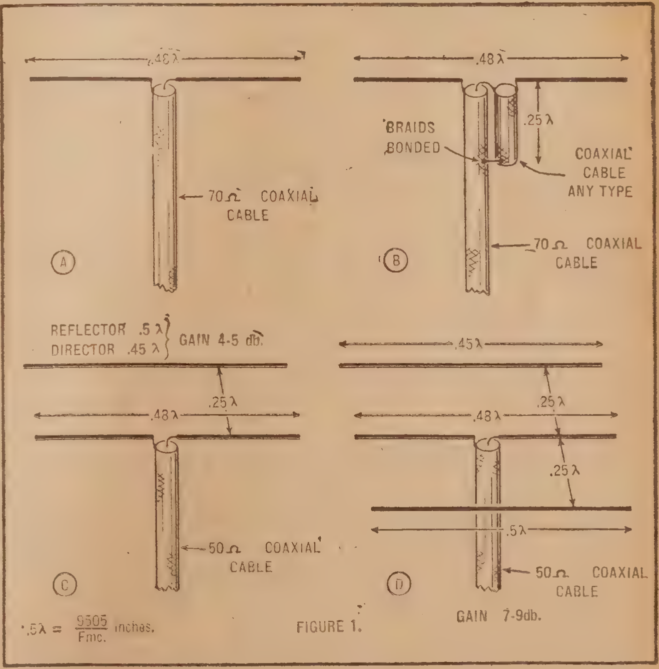


Fig. 1A—Simplest half-wave connection using 70 ohm co-axial cable and twinlead. Fig. 1B—a better connection for co-axial cable using a balancing section. Fig. 1C—A reflector or director may be added to give appreciable gain. Fig. 1D—A standard type of 3 element beam for general use. The balanced feed shown at 1B is to be preferred in a permanent installation, in this case using 50 ohn cable.

Strictly speaking, any aerial of this type and its associated elements, if any, should be carefully pruned in the operating position for exact length, but this procedure is often impossible. We have found in practice that the figures we shall give are quite near enough for most purposes, any improvement to be gained by further pruning having a value more academic than otherwise.

Having obtained a half-wave aerial, we must next arrange to couple it to a receiver or a transmitter. This is done with a transmission line which transfers the energy from one to the other.

Because the aerial is a tuned circuit, when energised it will have a distribution of current and voltage along its length. At the ends, the voltage is maximum and the current minimum, and at the centre the voltage is minimum and the current maximum. There will, as we would expect from Ohms Law, be a function of impedance associated with the aerial as a result. At the ends of the aerial it is a somewhat elastic figure of about 2500 ohms, and at the centre, 72 ohms.

FEED LINE CONNECTION

From the transmission line point of view, this resistive characteristic of 72 ohms is valuable when it comes to aerial connection. From an examination of transmission line theory, we see that if we use transmission line made to have a characteristic impedance of 72 ohms, and connect it correctly to the centre point of a half-wave aerial having also a resistance equivalent of 72 ohms, we can connect the open end of the line to a receiver or a transmitter with a good transfer of energy, being greatest when at this open end we arrange a connection which is also equivalent to 72 ohms. With this arrangement there is no tuning of the feeders required, and the transmission line can be made any length, the only losses incurred being those due to the limitations of the insulating material of the cable.

Other types of feedline can be used, but as these involve matching stubs and transformers to adjust impedances, &c., we will not deal with them here. We are concerned with simplifying as much as possible the design of aerials and their feed lines for the man who may be rather "raw" on the subject.

OPEN WIRE LINES

We would say, however, that by using balanced open wire feed lines of say 600 or 300 ohms, correctly matched, the losses incurred at these high frequencies are much less than by the use of balanced cable, or unbalanced co-axial cable. With leads up to about 40ft or so, the latter have been used by us without excessive losses, and the convenience of co-axial cable, its ability to run anywhere without affecting performance, and its durability, have made it hard to beat for the job.

The very simplest aerial connection is to use a length of 72 ohm balanced cable, generally known as "twin lead." It is connected to the aerial by cutting the element exactly in half, and connecting the twin leads to each side of the break in the centre. Connection to the receiver or transmitter is made by a one or two turn coupling coil into the tuned circuit, neither side of which must be earthed. An earth connection, if desired, must be made at the exact centre of the coupling coil to preserve balance in the circuit.

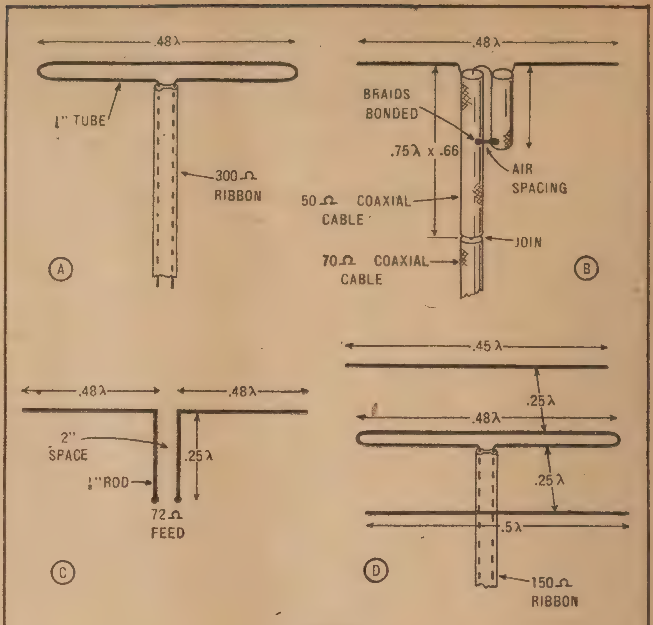


FIGURE 2

A.—Folded dipole fed with 300 ohm ribbon, spacing not cubical. Each dipole ends half-way around the band at the ends. B.—Almost exact matching for a 3-element beam may be obtained in this manner. C.—Two half-waves in phase with a gain of about 2.5 db. D.—A 3-element beam fed with 150 ohm ribbon. Both dipoles have the same diameter.

Losses in twin lead at frequencies as high as 288 mc, are rather high, however, and our recommendation, therefore, is either 70 or 50 ohm co-axial cable of good quality. The aerial diagrams shown here are prepared using this type of cable.

Connection to a half-wave aerial, using co-axial cable, may be made in the same manner (Fig. 1A), using the outer casing as one lead, and the inner cable as the other. At the far end, the same type of coupling coil is used, but the end connected to the outer braid is now earthed.

The unbalance introduced is not serious, even for transmission, the main objection being that the outer braid will pick up radiation from the aerial, which will set up standing waves along its length, and to some extent upset its operation.

BALANCING SECTION

If more than a few watts is used for transmission, a good idea is to use a quarter wave balancing section, as in Fig. 1B. This section may be a piece of co-axial cable of any type, since only the outer braid is used. A piece of copper tubing would do as well. The two sets of braiding are firmly soldered together ¼-wave from the aerial. At the feed point, the inner conductor of the feed line is connected to the outer braiding of the balancing section, and the aerial is fed from the two "outers" as shown.

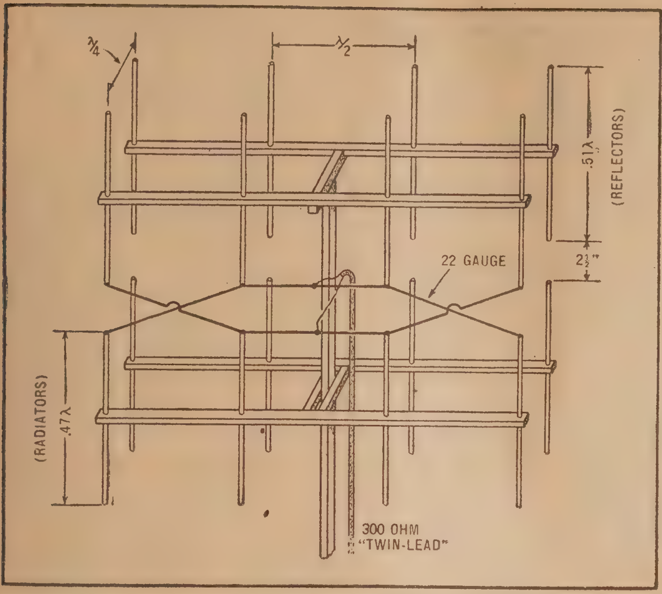
It is important that the balancing section should be well insulated from the feed line along its length by air spacing, the outer insulated covering of the cable itself not being good enough for the purpose. We now have a "balanced to unbalanced transformer." It removes the previously mentioned objection to the unbalanced feed, as the two points of aerial feed are now at the same potential with respect to earth, a condition impossible with the plain cable, as one conductor is, of course, completely enclosed by the other.

DIRECTIONAL AERIALS

If mounted horizontally, an aerial of this type operates best at right angles to its centre point, there being two rather sharp "null" points off the ends. A fixed aerial would, therefore, be mounted at right angles to the line of reception or transmission. If mounted vertically, it will operate equally well in any direction, the nulls now being immediately above and below it.

This directional effect of a half-wave aerial can be used to advantage by adding other half-waves, either driven from the feed line, or allowed to radiate by "shock excitation" from the aerial. The combined fields of the aerial and extra

A HIGH GAIN BEAM AERIAL ARRAY



A high gain beam array which combines a series of driven elements plus parasitic reflectors. Valves shown will give reasonable matching.

elements can be made to sharpen up the "beam," increasing results in one direction at the expense of those from other directions.

The simplest beam is one consisting of an aerial and a single reflector or director, which is not connected to the feed line. The operation of either will depend on its length and its spacing from the aerial. The maximum spacing for such an element is usually ¼-wave, and the minimum 1-8-wave for a reflector, and 1-10th wave for a director.

QUARTER-WAVE SPACING

In practice, ¼-wave spacing for each is probably the most satisfactory. At this spacing, gain will generally be best, exact length much less critical, and what is more important, the effect of the extra element on the feed resistance of the aerial will be least.

One extra element will reduce this 72 ohms to about 50 ohms, which is a good match for 50 ohm cable instead of 70 ohms as used for a single element. In practice, the reflector may be made an exact physical ½-wave (4 per cent longer than the radiator), and the director 5 per cent shorter than the radiator. These figures are not particularly critical with ¼-wave spacing, but should not be less than those given. The reflector gives a little less gain than the director, but, in both cases, the gain is appreciable.

An even higher gain may be achieved by using both director and reflector to make a three element beam. With ¼-wave spacing, and lengths as above, this makes about the most useful beam. Use of two elements reduces the 72 ohms to about 30-35 ohms, but, in practice, the 50 ohm cable will still operate well.

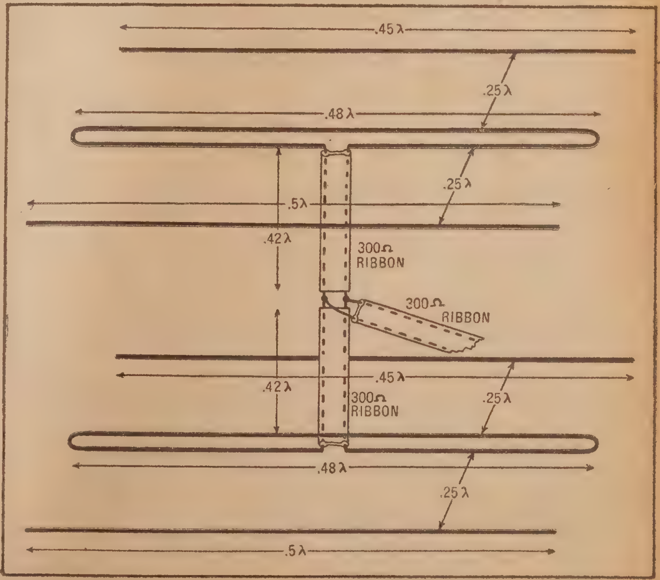
Almost exact matching can be ha by using a length of 50 ohm cab as a matching transformer for suc a beam. It is connected at one en to the aerial, and at the other en direct to a feedline of 70 ohm cabl The quarter wave section of 50 ohm (z0) steps up the 30 odd ohms o the aerial (z1) to about 70 ohm (z2) according to the well-know formula for a quarter wave matching section (z1 equals z0 squared divided by z2).

Because the cable is not insulate by air, an electrical quarter wave i shorter than the physical length b about 33 per cent, a figure whic holds good for any co-axial cabl with polythene insulation. Therefore, the 50 ohms matching sectio must be shortened by one-third from the calculated length.

PROPAGATION CONSTANT

This is not the case with the balancing section previously described because here we are dealing purely with the characteristic of the oute braid only, and not with propagation through the inner conductor. If a balancing section is used as well as the matching section, therefore, it is best to use a ¾-wave section for the latter to avoid an awkward join. The extra half-wave of the matching section (reduced also by one-third!) will not affect the matching, as a half-wavelength of transmission line merely repeats the impedance fed into one end of it, irrespective of its own characteristic impedance. Our diagram shows clearly how all this may be done.

A multi-element beam of this type greatly increases reception or transmission in a forward direction, and suppresses it from the back and the



Another popular array known as the "3 over 3". It is actually two 3 element beams mounted one above the other.

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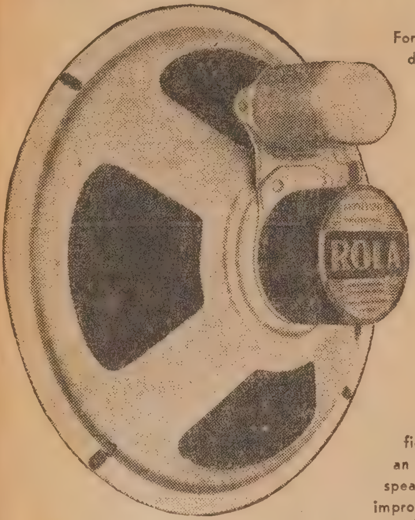

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sides. It will, therefore, reduce possible interference from other stations not in its effective beam, which, incidentally is about 20 degrees each side of its forward axis. Outside this region, attentuation is quite rapid.

Constructionally, it is a simple job. The parasitic elements—the reflector and director—need no insulation at their centres, and may be fastened to, or pushed through, a wooden boom to support them. The aerial, because of its centre feed, should be insulated at the centre points, but, in practice, this insulation need not be superlatively good, as the voltage concerned is quite low.

Good bakelite or WT22 may be used to insulate the aerial, and we have often mounted the elements on plain wood as a temporary measure. This isn't the best scheme however, particularly when the wood gets wet. The whole job may be made of metal tubing, the only insulation required being that of the driven element itself.

FOLDED DIPOLE

The folded dipole is often used where a feedline of 300 ohms is required. A folded dipole is well described by its name. It consists of two half-wave dipoles spaced quite close together, and joined at the ends. When one of the dipoles is broken in the centre for attachement of a feed line, the impedance is no longer 72 ohms, but four times that figure, namely 288 ohms, providing the two dipoles have the same diameter. It operates as an impedance transformer with a step-up ratio of 4-1. It is possible, therefore, to attach a length of 300 ohm twin-lead directly to the broken element as shown in Fig. 2A.

The addition of a reflector or director to such a dipole will reduce its feed impedance as for a normal dipole, but if ¼-wave spacing is used, the matching will be reasonably good, and aerials, particularly for reception, are often used in this manner. For a three element beam, shown in Fig. 1D, however, the impedance will be lowered too greatly for a good match with 300 ohm lead, and it will be nearer 150 ohms—near enough for this type of ribbon to be used satisfactorily.

IMPEDANCE TRANSFORMER

By varying the diameter ratio of the two dipoles, greater impedance step-up ratios may be obtained, a useful point when matching into feedlines. For instance, a 1 inch diameter dipole spaced 1½ inches from a ½ inch dipole broken for feeding, gives a step up in impedance of 6.9—1. If the broken dipole is of .25 inches diameter, the other dimensions remaining the same, the step-up is 10.5-1.

Such a dipole therefore, if used with our 3-element beam, would require a feed line impedance of about 30 ohms times 10.5, or near enough to 300 ohms, making the 300 ohms ribbon a suitable feed. If the diameters are 1 inch and .25 inches re-

(Continued on Page 89)

THE BANDSPREAD SIX

(Continued from Page 33)

such that the tapping is about 2.5 volts positive to earth or chassis and to which the cathode of the indicator is taken.

This very slight bias of about 0.5 volts on the grid of the triode amplifier of the indicator prevents grid current flow which would produce additional shunting of the diode load resistor.

Unfortunately, the control voltage for the indicator could not be taken from the AVC diode plate because, with the delayed AVC, the "eye" of the indicator would not begin to close until the delay voltage had been overcome by sufficient signal.

The value of the resistor feeding the target anode of the indicator has been increased from the usual value of .02 megohm to .05 megohm to reduce the screen intensity slightly in the interests of increased screen life.

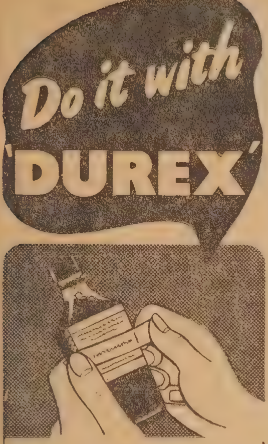
EARTHING

From the constructional point of view, there is little to add other than the old story of single-point earthing for the braid of the shielded wiring to and from the volume control. Insulate each of the three runs of the shielding from each other and the chassis. Connect together the braid of each of the leads wired to the ends of the volume control and earth the braid of lead returning to the cathode of the 6AR7-GT at the common earth point for that valve. The braid of the lead from the moving arm of the control to the grid of the 6SJ7-GT through the coupling capacitor should be earthed at the common earth point close to the socket of that valve.

GROUPING

Generally speaking, the components for each stage are grouped around their respective valve sockets of IF transformers. The use of tag strips will be found to add to ease the wiring and the mounting of components. You will find it helpful to wire certain lugs on the function switch before it is secured into place. In selecting the sections of the swit for their particular function, mak a rough mental survey of how th components will fit, and if this mak for short leads, wire accordingly.

As far as the tuning unit is con cerned, most of the points to watc are covered in an enclosed da sheet. Similarly, information o how to go about checking the align ment of the tuned circuits is give if this is found necessary.



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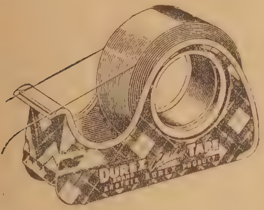

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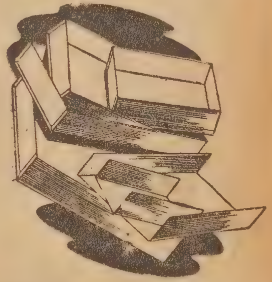

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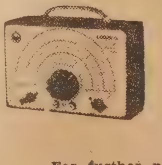

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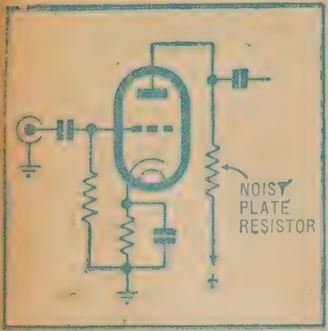
FROM THE SERVICEMAN WHO TELLS

"What kind of a noise annoys an oyster?" so runs the old gag line. I can't speak for an oyster, but the answer as far as servicemen are concerned is one which goes scratch, scratch, scratch at odd intervals.

THE other day I received a visit from the owner-player of an mpressive-looking electric style uitar. He explained that the mplifier had developed the habit producing its own noises at the ost inopportune times.

To prove the point, he connected the whole box of tricks on the ot, turned up the gain and stood ack waiting for something to happen.



Crackling noise in an amplifier was traced to a faulty 0.1 meg. resistor.

After a couple of minutes, the speaker produced something that sounded very much like an attack of electronic indigestion.

I immediately turned the volume control back and found that the noise was reduced, demonstrating that the trouble was at least confined to the preamplifier stage.

When the amplifier was finally taken from its case, I discovered that the circuit was a fairly conventional one, with a triode preamplifier ahead of the volume control.

When the noise again made itself apparent, I quickly shorted the grid to chassis, but this made no difference to the noise.

ROUGH TEST

Next operation was to short the cathode to chassis. This is a rather rough and ready test, but it is permissible in such cases. The presence of a plate load resistor prevents the tube drawing dangerous current, and it is far more important to work quickly, while the noise persists, than to be fussy about an academic approach.

Shorting the cathode made only a slight difference to the quality of the noise, but this was to be expected because it altered the plate current and the characteristics of the valve.

The main point was that it removed any suspicion of intermittent trouble in the grid or the cathode return. It was now a matter of the valve itself or its output circuit.

The plate was fed through a 0.1 meg. resistor, which was a carbon type with copper wire twisted around the ends of the element to provide the electrical connections.

I looked with suspicion on this component, as I have frequently encountered trouble with noisy plate resistors. A new one was temporarily wired in place, and there was no sign of the crackling noise.

Looking over the rest of the wiring, I noticed an exactly similar resistor in the plate circuit of the second valve, which happpened to be a pentode, with feedback applied. Out of curiosity I disconnected one end and put the ohmmeter across it.

Instead of the rated value of 0.1 meg, it read just 1.0 meg, so that the associated valve was working more by good luck than good management. The two resistors were duly replaced and the faulty ones cut in half before being dropped into the rubbish box.

FAULTY GEAR

I have learnt from experience not to leave faulty components lying around. It is very easy to forget all about them and later to assume that they are really good components, which have accidentally fallen on the floor. Put the cutters through them and there is no more argument!

On the subject of noise, I recall a lot of trouble the servicemen had a few years ago with RF chokes in old style audtodyne superhets. These chokes had the unique ability to develop spots of corrosion and operate for months on end, while producing a faint scratching sound in the output. The cure was to replace them with a new choke, or with a resistor of about 10,000 ohms or simply short them out.

The RF choke in the plate circuit of an anode bend detector might be academically correct, but it does not appear to serve much purpose in the majority of receivers.

Some faint crackling sounds have a much more subtle origin One tries to isolate them by shorting out one stage after another, only to be faced with an apparently contradictory situation. The noise appears to be associated with one stage, but no amount of fiddling will stop it.

BREAKDOWNS

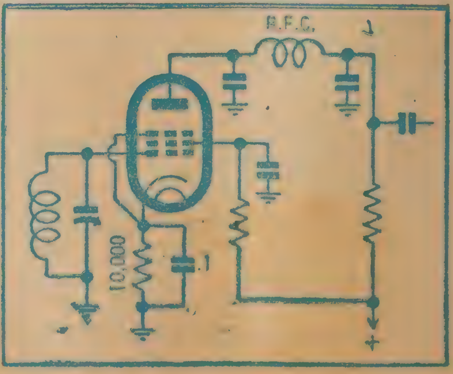
However, a partial breakdown in the power transformer in the rectifier socket or the voltage divider in particular can generate minute arcs which are reproduced by the set exactly as electrical interference.

Fortunately, this circumstance is rare and not long lived, since the arc, which is causing the trouble either disappears or leads to complete breakdown. As I have said before, I would rather have an honest-to-goodness breakdown any day than intermittent troubles.

My earlier reference to electric guitars calls to mind an incident a few weeks ago.

I happened to be backstage during a local variety concert attending to the PA system and a row of lighting effect switches. It was a charity affair and you know how it is when the village promoters know you have some knowledge of electricity and a slightly soft spot for the footlights . . .

On stage, an electric guitarist was just getting into his act when the music ceased abruptly to go round and round. From my vantage point in the wings I was suddenly aware of a bright glow from the back of



R.F. chokes in plate circuit of an anode-bend detector frequently produce noise.

the amplifier cabinet which could only be caused by a red-hot rectifier.

I knocked the switch off and saved the rectifier, but no amount of promptness could save the artist's face as he "slowly walked away."

The explanation, of course, was a breakdown in the first electrolytic condenser—the one immediately following the rectifier. If you see the plates suddenly flare red hot, you can be 99 per cent sure of the cause. Unless the current is switched off within a few seconds, the terrific heat and the emission current will literally tear the filament in half. Don't ask me how I know—I have good reason to know.

My own domestic receiver — a rather elaborate prewar triple-wave job—had been playing up quite a lot, until its behavior was becoming a menace to domestic bliss. But I simply kept putting it off—you know the story of the plumber's gas pipes!

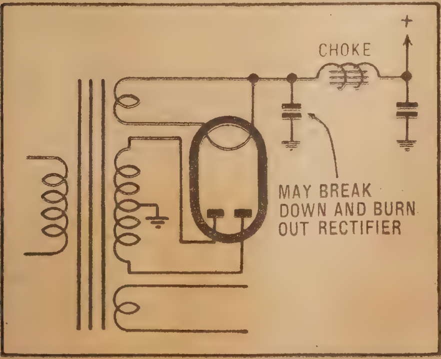
When first switched on, it was often necessary to flick the wave change switch. If it stopped at other times it was necessary to bump the cabinet. You could turn it off any time by jumping on the floor. Apart from these peculiarities, it was all right!

DRY JOINT

I soon traced the explanation of the bumping business to a dry joint on one of the valve sockets, but repairing this did overcome its tardiness in starting.

Running the meter over the set, I discovered that the HT volts were down to about 170. No wonder the reproduction wasn't as impressive as it might have been (I forgot to mention that). Evidently the poor old rectifier had "had it," so I made a trip into the shop to get a new one. As it turned out, the only one on the shelf was a special rectifier like the 5U4-G — similar construction but wider spacing between the leads down the glass pinch. This was duly plugged into the set and the voltage again measured.

Alas and alack, the volts were still well under the 200 mark. Obviously then, the first electrolytic was low in value — I remember explaining this a few months ago. It was the work of a moment to turn the chassis over and wire in a new condenser. This time the volts were right —but not for long.



Too high a value for the oscillator grid condenser can cause squegging on the short-wave band.

No sooner had the set begun to play like its old self than there was a sudden plop and an ominous silence. By the time I spotted the red-hot rectifier and pulled the switch, the filament was no more. Yes, it was the new one—the old half-worn-out 5Y3 lay serenely on the table. Ah, well . . . I got quits on the so-and-so electrolytic by hurling it violently into the rubbish bin. My new rectifier followed in sad procession.

When order was finally restored, the set proved itself able to come on without flicking the switch. Apparently the oscillator circuit or the converter valve was cut a trifle fine, so that its performance with a drastically reduced supply voltage was uncertain.

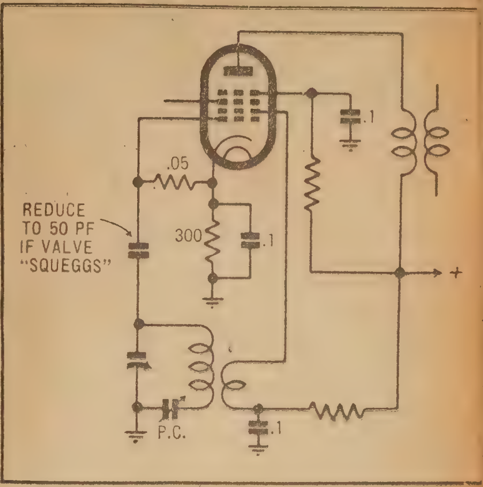
Speaking of converter valves, a 5-valve dual-wave job came in the other day with the complaint of noisy and intermittent operation. Tapping the chassis was enough to make a really impressive din, especially on the short-wave band.

THE CONVERTER

Ultimately, I surmised that the converter valve—an EK2-G — was faulty, because the lightest tap on the envelope would produce a crackle in the output. I more or less proved the point by plugging an ECH35 temporarily into the socket and noting that the noise disappeared.

When a new EK2-G was ultimately obtained, it was noted that the replacement had no metal coating on the glass. When plugged into the socket, it performed normally on broadcast but made strange rushing and popping noises below 20 metres on the SW band.

A red-hot rectifier usually signifies a broken down first filter condenser. Switch the set off immediately.



My first reaction was to blame the absence of shielding but a temporary metal shield over the valve made no difference worth speaking of. Perhaps the oscillator was "squegging."

On examination, the oscillator proved to have a 100 pf oscillator grid condenser, with a 20 ohm series resistor, apparently as a precaution against this very effect. A larger resistor did not improve matters, but substitution of a 50 pf oscillator grid resistor cleared the trouble immediately. Valves like the ECH 35, 6J8-G &c., should never have more than 50 pf in the oscillator grid condenser, at least for short-wave work.

Apparently the new EK2-C I had picked up was a trifle "hot" or different in its oscillator characteristics, giving the same squegging effect with too large a grid condenser.

If your dual-wave set hisses and bubbles around the 15-20 metre region, start thinking about the oscillator constants—they are often to blame!

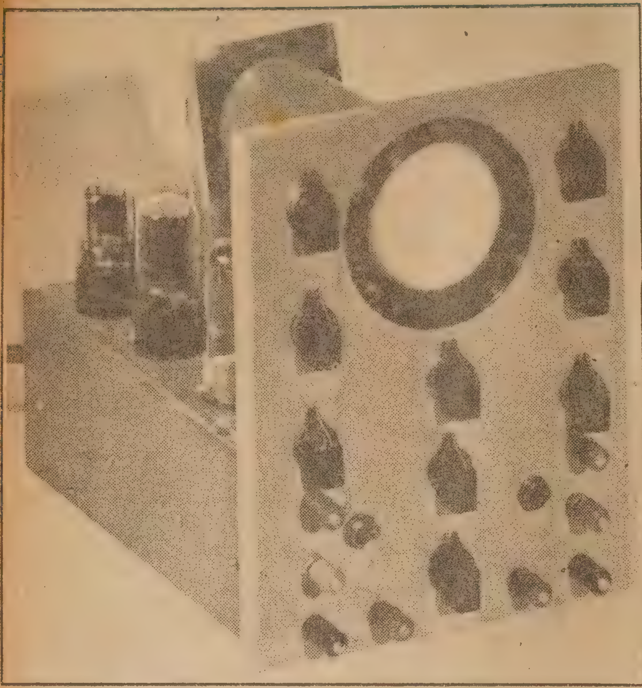
QUOTATION

By way of conclusion, I quote from a letter from Mr. S. J. Aslin, of Kongorong, SA. Says Mr. Aslin:

"Being the only person in the district interested in the technical side of radio, it is not an uncommon sight to come home from work to find someone's 'bitzer' adorning the kitchen floor, so these articles are stored, mentally, for future reference.

"The only instance I can recall which may be worthy of inclusion in these features, and one which made me burn much midnight oil, was caused by a little re-wiring, not revealed, by a brainy lad. He brought me his set with the information that it had stopped and (you know the story), no one had touched it.

(Continued on Page 99)



The vertical controls are at left, horizontal at right. From top to bottom left, we have—V shift, intensity, V gain, V plate, V amp, input and earth. Rigth: H shift, focus, H gain, H plate, H amp, input, earth. Controls at centre are synchronising, fine frequency, and course frequency. Switches are: left, int.-ext. sync., and right, int.-ext. sweep. The terminals below each switch are the external synchronising and 50 cycle output voltage.

A STANDARD SMALL CRO

It is two years since we described the construction of a cathode ray oscilloscope, and since that time readers letters have shown the great interest taken particularly in the 5-inch models using the 5BP1 tube. There is however, a potential demand for a small standard design, smaller even than the 3-inch job we detailed in the issue of January 1948. It is to supply this demand that we have built up this compact and invaluable little instrument.

by Derrick Williamson

TIME was when the owner of an oscilloscope was considered either a luxurious fellow or a highly technical one. It was to many the unapproached mystery box of radio, capable of producing mysterious and wonderful patterns in the hand of the expert, but hopeless confusion to the beginner.

The radio art has progressed since those times, and today radio servicemen and experimenters are much more familiar with the operation of a CRO and more aware of the thousand and one jobs it can do for them.

Essentially a CRO is an instrument for examining simple and complex wave-forms by displaying them on a luminous screen, traced by a flying spot, which can be made to move at the same time in both a vertical and horizontal plane. By using an internal time base, which sweeps the spot horizontally across the screen at a known and variable speed, we can examine the shape of a wave-form, which moves the spot in a vertical direction. We could, if desired, calibrate the gain controls related to the amplifiers on both horizontal and vertical connections, thus making the CRO a voltmeter as well as a displayer of the waveform associated with the voltages we are examining.

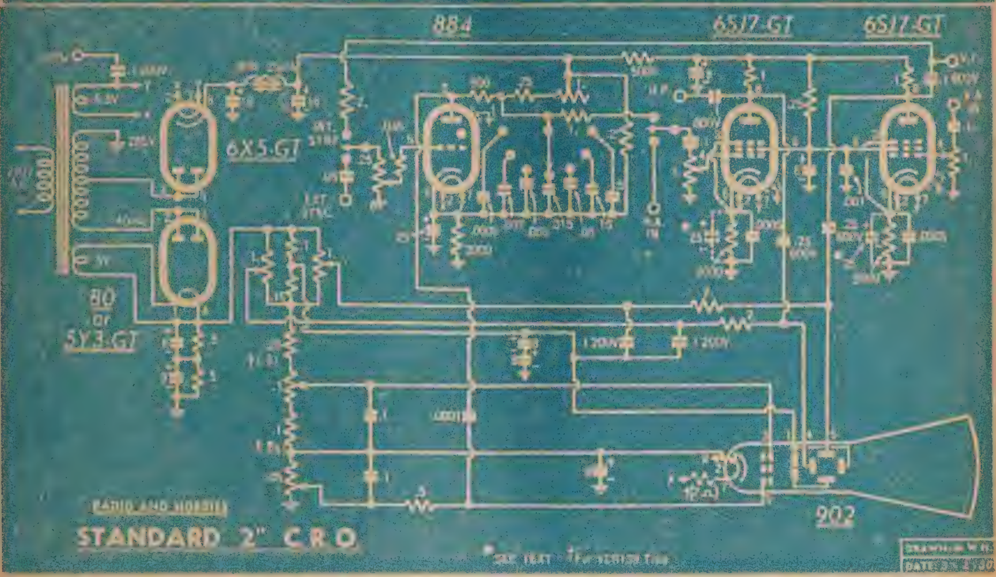
An elaborate CRO, intelligently used, can do almost anything, and for such an instrument a screen diameter of five inches or even larger is most valuable. It is possible, however, to make a job very much smaller than these full-sized CRO's, which will do virtually anything their big brothers can accomplish, with the main limitation of a smaller image.

If, however, we consider a tube which has a screen diameter of two inches or thereabouts, we will find that for normal service work, particularly dealing with audio amplifiers, checking transmitter modulation patterns, &c., the smaller screen imposes by no means a really serious limitation. On the credit side we have a big advantage in portability, since the physical size of the CRO can be reduced to about half that of the bigger jobs, with a proportional reduction in weight. In other words, we can easily carry it about.

Cost, too, is less, even allowing for the present low price of the 5BP1, and the voltages required for good results need not be higher than 600—about half that required for full operation of the bigger tubes.

The main design features—a built-in time base, amplifiers for both sets of plates, shift controls and synchronising controls—can all be retained without unduly straining the available space. In our particular design, we have been able to do away with the use of any non-standard components, including the power transformer, which is generally of a

CIRCUIT DIAGRAM OF THE STANDARD C.R.O.



The circuit has been arranged to use standard radio parts and valves.

special type. It is, in fact, highly probable that most of our readers will be more interested in this compact design than in the larger models.

Is it hard to build up a CRO? Our experience has been that it is not. After all, there is no special magic required to make it work, any more than there is for an ordinary radio receiver. It may be that the tube itself is an unfamiliar device, but properly wired up, it can't very well refuse to work any more than can a properly connected five-valve radio set. There are no more valves to worry about, and as we have worked out all the component values for you, it resolves itself more or less to a matter of construction.

TIME BASE

The time base is quite a straightforward affair, and the amplifiers are of the same type as used for the audio stages of a radio or a gramophone. If you are used to making up radio sets, you should be able to make up this CRO quite successfully.

As for the tube itself, we have designed for a standard type—the 902, just as we have used standard parts elsewhere in the circuit. In addition, the CRO will work perfectly with the VCR139 disposals tube, of which there are many in the hands of readers and which occasionally can still be obtained. Slight changes in component values are needed from those for the 902, and the circular hole in the front panel is a little larger for it. In general, however, the design is the same.

We are very pleased with this little job, and can confidently recommend it to anyone for whom its small size and low price are valuable.

Having built your CRO, you would be well advised to buy a good book dealing with its use, unless you are already familiar with it. A series of articles would be needed to cover this subject, and this month we cannot do more than tell you how to make our latest production.

PART LIST FOR 2-INCH C.R.O.

1 Chassis 10" x 7" x $3\frac{1}{2}$". Complete with C.R. Tube mounting bracket.
1 Panel $9\frac{1}{2}$" x $7\frac{1}{2}$" x $\frac{1}{2}$.
1 Case $10\frac{1}{2}$" x $9\frac{1}{2}$" x $7\frac{1}{2}$".
1 Small power transformer 285 V CT 285V 40 mA. 6.3V 3a 5V 2A.
1 30 H 25 mA. filter choke.
1 4 pin socket (octal socket if 5Y3-GT is used).
5 octal sockets.
9 small pointer knobs.
8 terminals (6 red, 2 black).
2 Two-way toggle switches.
1 12 position single circuit rotary switch.

VALVES

2 6SJ7-GT, 1 6X5-GT, 1 80 (or 5Y3-GT), 1 884, 1 902.

RESISTORS

3 2 meg $\frac{1}{2}$ watt.
1 1 meg $\frac{1}{2}$ watt.
5 1 meg potentiometers.
3 .5 meg $\frac{1}{2}$ watt.
3 .25 meg 1 watt.
1 .25 meg potentiometer.
1 .2 meg 1 watt.
1 .15 meg 1 watt.
4 .1 meg 1 watt.
1 .1 meg potentiometer.
1 .05 meg potentiometer.
1 .035 meg $\frac{1}{2}$ watt.
1 5,000 ohms 1 watt.
1 3,000 ohms $\frac{1}{2}$ watt.
2 2,000 ohms $\frac{1}{2}$ watt.
1 500 ohms 1 watt.

CONDENSERS

1 25 mfd 40 pV electrolytic (miniature type).
2 16 mfd 525 PV electrolytic condensers (chassis mounting types).
7 8 mfd 525 Pv electrolytics (pigtail types).
2 .25 mfd 600 V tubular.
2 .1 mfd 600 V tubular.
4 .1 mfd 400 V tubular.
2 .1 mfd 200 V tubular.
1 .05 mfd 400 V tubular.
1 .001 mfd mica.
1 .0001 mfd mica.
2 .0005 mfd mica.
1 .0001 mfd mica.

TIME BASE CONDENSERS

1 .0008 mfd (.0005 mfd plus .0003 mfd) mica.
1 .002 mfd mica.
1 .005 mfd mica or tubular.
1 .015 mfd (.01mfd plus .005 mfd) mica or tubular.
1 .05 mfd tubular.
1 .15 mfd (.1 mfd plus .05 mfd) tubular.
1 .5 mfd tubular.
(All tubular condensers are 400 V working.)

SUNDRIES

Hook-up wire, solder, solder lugs, nuts and bolts, bakelite mounting strips, insulating washers for spot shift controls, metal shield for C.R. tube (preferably Mu-Metal.), power flex etc.

MAGRATHS HAVE THEM!

In addition to the popular Connoisseur products listed below, new pick-ups and turntables specially designed for use with the latest micro-groove long-playing records are on the way.
Amongst these is a two-speed turntable giving speeds of 33 1-3 and 78 r.p.m. Full 12" in diameter, lathe-turned and manufactured in non-ferrous material. The main spindle, precision-ground and lapped, runs in phosphor-bronze bearings, and is virtually vibrationless. High-grade studio microphones and recording equipment.
All Connoisseur products are precision-built and individually tested.

Connoisseur (Reg'd) PICK-UP . . .

An acknowledged leader in its class, giving an even response curve from 30-1200 C.P.S. Only 30 grams is required at needle point for correct tracking. 2 models are available; standard (illustrated) for 10"-12" discs and transcription arm model for playing 17" discs.

Connoisseur (Reg'd) GRAMO-MOTOR

Is designed for the connoisseur who likes these fine technical developments that produce faithful reproduction. The heavy non-ferrous turntable is machined to run dead true, the flywheel action eliminating all "Wow."

Connoisseur (Reg'd) AMPLIFIER

Is in the true tradition of Connoisseur sound reproducing instruments. Distortion at 5W is less than 0.5 per cent. Bass control variable from 3 to plus 15 db at 50C.S. Treble control variable from minus 20 to plus 8 db at 15kcs.

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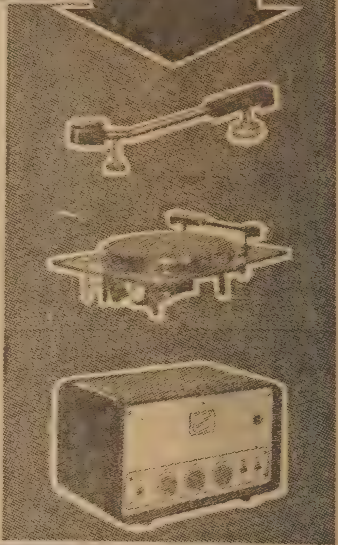
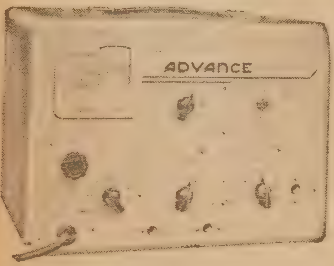


TEST GEAR

BY

"ADVANCE"



Designed to the discerning radio service engineer, the Type "E" Signal Generator is a robust, portable Instrument of exceptional dependability. This high performance is due to the design being based on standard signal generator technique. Its range is sufficiently wide to cover all present needs and likely developments in the servicing and design of radio and television receivers. Widely used by Australian Government Departments.

The frequency coverage is 100 Kc/s-60 Mc/s in 6 ranges plus 60-120 Mc/s using the second harmonic of range "A." Accuracy is guaranteed to be within plus or minus 1%. Internal modulation is 30% at 400 c/s. A.F. output is variable from 0-5 volts. The accurate attenuator system embodies a non-inductive slide wire followed by a 5 decade 75 ohm ladder network. Use of a 75 ohm cable correctly terminated ensures that there are no reflections due to mis-match. This arrangement means that the output voltage at the dummy aerial is accurate and also helps to overcome the problem of poor attenuation at frequencies above 10 mc/s. Stray leakage is less than 3 microvolts at 60 Mc/s.

An illuminated directly calibrated dial with a scale length of over 30" is provided and this is easily and accurately set by means of a slow motion control with a reduction ratio of 10-1.

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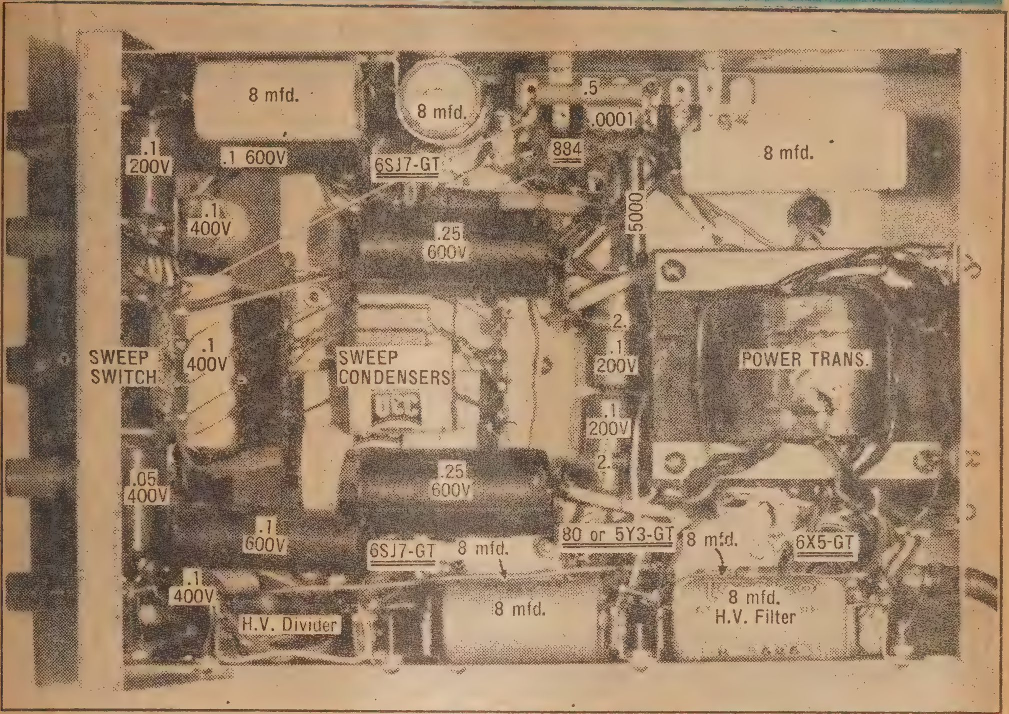
Manufactured by: ADVANCE COMPONENTS LTD., Great Britain.

CAREFUL LAYOUT IS IMPORTANT FOR SUCCESS



Wide separation of components associated with vertical and horizontal plates is essential to avoid coupling between them. Some of the major components are keyed in this picture.

The chassis can be made quite small and compact as both the 902 and the VCR139 are small tubes. The chassis actually measures 10in x 7in x 3½in, and is fitted with a front panel 9½in high and 7½in wide with a ½in flange around the edges. The whole unit is housed in a neat case which measures 9½in high, 7½in wide, and is 10½in long.

The chassis layout has been arranged so that the amplifiers are placed one on each side of the tube. This avoids unwanted coupling between the horizontal and vertical deflection systems and allows short grid and plate leads.

The gas triode time base valve is mounted directly behind the horizontal amplifier valve, while the high voltage rectifier occupies a similar position behind the vertical amplifier valve.

POWER SUPPLY

The small vertical mounting power transformer is mounted under the chassis on the back end. This position considerably reduces the effects of the external magnetic field around the transformer and prevents serious deflection of the spot due to this field. The small filter choke is mounted above the chassis in the rear right hand corner behind the gas triode valve, and in this position no precautions are necessary to restrict the small field produced by the choke.

The low voltage rectifier, which supplies power for the amplifiers and the time base, is mounted on the corner opposite to the choke. The two electrolytic condensers, which form, with the choke, the low voltage filter system, are mounted on the rear of the chassis directly behind the CR tube mounting bracket.

The position of the mounting bracket for the CR tube is the same for the VCR139 as for the 902, the only change being in the diameter of the mounting hole required. Remember, also, that if you intend to use the VCR139 tube, order the front panel with a suitable hole, as the VCR139 has a diameter of 2¾in as against 2in for the 902.

You will notice from the under-chassis photograph that we have used bakelite mounting strips to anchor most of the components. This is essential in an instrument of this kind if interaction between the amplifiers and risk of short-circuiting the power supplies is to be avoided.

The extra time involved in carefully planning the layout and mounting the components is well worthwhile. The finished job is then much neater, more efficient and much easier to service when this is necessary. Good layout is essential also because it is not permissible to use any shielded wire in a CRO if good high frequency response is required. This means that grid and plate leads must be kept well away from all AC leads in order to avoid hum pickup.

And now let us turn to the electrical design.

The first point to consider in the design of any CRO is the method of obtaining the voltages required to operate the tube and the various amplifiers &c. This usually entails the use of a specially designed power transformer which has two 6.3 volt windings, two 5 volt windings, and a high voltage secondary winding with one half of this winding extended to give the necessary voltage for the CR tube supply.

STANDARD COMPONENT

A transformer of this nature will work very well indeed, and, in fact, for the larger CRO's, it is the only easy way of obtaining the voltage unless an RF power supply is used. However, the cost of a special transformer is high, and it is not always readily available. We decided to see if it was possible to use a standard power transformer as the voltages required for satisfactory operation of the 902, and the VCR139 are comparatively low compared with the larger tubes.

We finally decided that a power transformer with a 285 volt per side HT winding would be most suitable for our requirements. One end of the secondary was earthed, and two half

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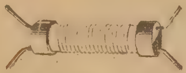

5 BAND COILS

These coils are moulded in trolitul and grooved in a lathe, thus keeping the winding accurately spaced and providing perfect tracking. The four lugs are moulded two in each end as illustrated so that the coil will fit snugly across the switch.

Metres	Aerial	R.F.	OSC.
10	H.124	H.125	H.126
20	H.127	H.128	H.129
40	H.130	H.131	H.132
80	H.133	H.134	H.135
B/C	H.136	H.137	H.138

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LOW LOSS COIL LACQUER

TYPE RH.34

PRICE 2/6

LINE FILTER COIL

TYPE RF.15

PRICE 11/-

COIL FORMERS

6 PIN PLUG IN

These transparent coil formers are moulded from Polystyrene powder. They are engraved for frequency and type, and indented for colour spotting. May also be grooved from space winding. Socket pins are heavily nickel plated.

TYPE	PRICE
1.24 1¼ dia.	3/3
1.25 1½ dia.	3/5

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Round Can 2½ x 1⅜ dia.

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RADIO FREQUENCY CHOKES

RF. 81 Silk Honeycomb	1/9
RF. 82 3 PIE 1.7 M/H	4/6
RF. 83 4 PIE 2.5 M/H	4/6
RF. 84 5 PIE 4.0 M/H	4/6
RF. 85 6 PIE 7.0 M/H	4/6
RF. 106 Vibrator Low Tension	4/3

5 IN 1 TRIMMER

TYPE CG.27

PRICE 4/6

ALWAYS SPECIFY **R.C.S.** FOR PERFORMANC

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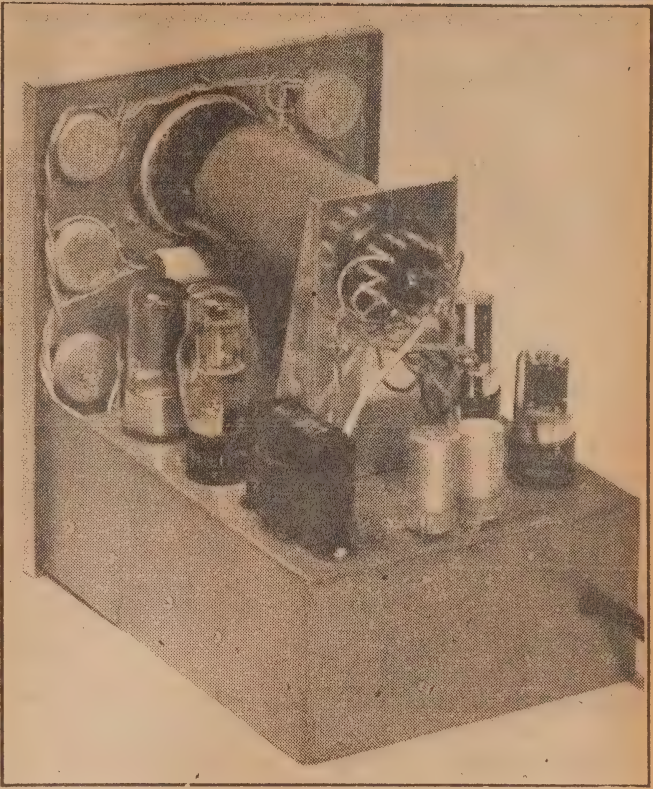
A REAR VIEW OF SMALL C.R.O.



This picture shows how the valves are positioned. The valve behind the choke in foreground is the 884. The shield around the CRT should not be earthed.

wave rectifiers were used. One of these is connected to the centre tap of the winding, and supplies the amplifiers and the time base, while the other connects to the top of the winding and supplies the CR tube.

As CR tubes draw very little current it is possible to realise almost the full peak voltage of the transformer, and in practice over 700 volts are available to supply the tube.

The fact that there is only one five volt winding available on a standard small power transformer made it essential to use a 6X5-GT rectifier for the low voltage power supply. For the high voltage supply an 80 is the logical tube to use, as it will easily handle the voltage when used as a half wave rectifier.

The 80 is to be preferred to the 5Y3-GT, as it has slightly better base insulation. However, the 5Y3-GT can be used if you desire, but do not use any of the spare pins as anchor points as this may lead to break down which may ruin the valve or the power transformer, or in some cases, both.

SWEEP GENERATOR

The time base or sweep generator is of conventional design and utilises an 884 gas triode valve. The function of this generator is to supply a saw-tooth output voltage of varying frequency which will cause the trace on the CR tube screen to traverse from left to right at a comparatively slow rate, with a return trace so fast that it is almost impossible to see. Some of the output is also fed to the control grid of the CR tube in such a way that this return trace is completely blacked out.

The generation of this voltage is accomplished by charging a condenser through a resistor and then suddenly discharging it. The voltage across the condensers builds up slowly until a critical voltage is reached. When this critical voltage is reached the gas triode which is connected across the condenser conducts and quickly discharges it.

The charging cycle of the condenser causes the spot to traverse the screen slowly from left to right while the discharge cycle causes the spot to quickly return. The frequency at which this charge-discharge cycle takes place is determined by the time constant of the resistor and the condenser. The frequency of operation can, therefore, be varied by changing the condenser, the resistor, or both.

In practice it is usual for the condensers to be switched for a course change in frequency and a variable resistor used to obtain fine frequency control.

SAFETY

The 500 ohm resistor in series with the plate of the tube limits the current to a safe value so that the tube will not be damaged by excessive discharge currents. The critical point at which the tube conducts is controlled by the voltage on the grid of the 884. This is usually taken from the output of the vertical amplifier so that the sweep frequency may by synchronised with the wave form under observation. A switch and terminals are provided so that the generator may be synchronised with an external source if desired.

The HT supply for this tube is taken directly from the output of the low voltage filter. A bleed of approximately 1½mA is provided to help stabilise the bias voltage for the 884 under the conditions of varying plate current.

The voltage amplifiers are designed to have good frequency response with high output voltage capabilities and reasonable sensitivity.

The screens of the two valves are fed from a common resistor, bypassed with an 8 mfd electrolytic and a .001 mfd mica condenser to ensure good frequency response. To improve the high frequency response the plate load resistors are kept to quite a low value. This reduces the impedance and reduces losses due to wiring and valve capacities. The cathodes are also bypassed with .0005 mfd mica condensers, causing the gain to increase at high frequencies, thus offsetting any losses that may occur.

Under these conditions the amplifiers are virtually flat from 20 cycles to about 25 kc. However, the gain of the amplifiers is not particularly high when operated with unbypassed cathode resistors, so we have shown dotted 25 mfd electrolytics in the circuit. The inclusion of these condensers will increase the amplification by 6db, but the high frequency response will start to fall away at about 15 kc. If you require the extra gain, however, and do not mind the slight loss in extreme high frequency response, these condensers can be included.

DECOUPLING

In order to simplify the terminal arrangement we have not provided for direct connection to the plates of the CR tube. However, voltages can be applied to the plates through the .1 mfd coupling condensers. This means that the amplifier valves are always in circuit. This does not cause any trouble and is standard practice with at least one well-known manufacturer.

The HT supply for the amplifiers is decoupled with a 5000 ohm resistor and an 8 or 16 mfd electrolytic condenser. This gives extra filtering and also prevents the slight ripple caused

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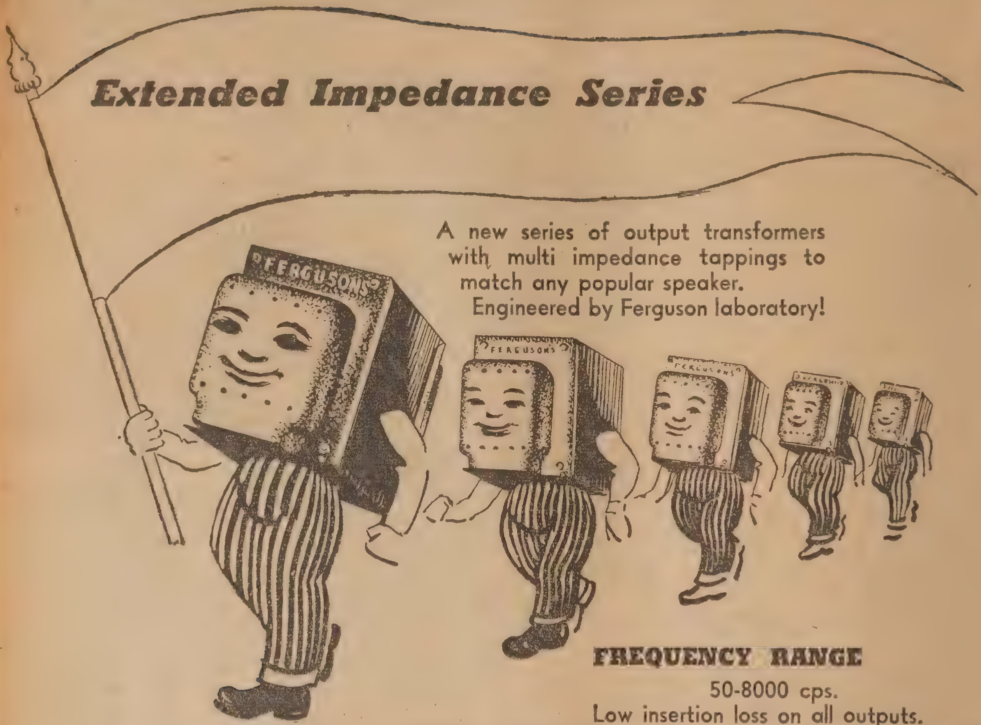

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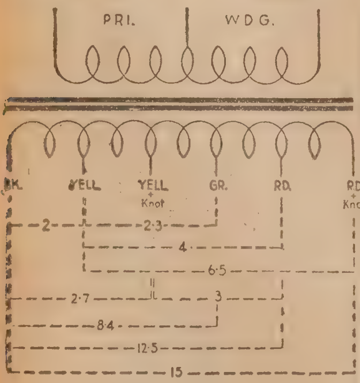

TYPE	PRIM. Z	WATTS
OP 54	5000 2500 SE	10
OP 55	5000 PP	15
OP 56	6600 PP	15
OP 57	10000 PP	15
OP 58	5000 6600 10000 PP	15
OP 59	5000 6600 10000 PP	25
OP 60	5000 6600 10000 PP	32

Secondary Impedance available on all types

2 2.3 2.7 3 4
6.5 8.4 12.5 15

Obtained by selection of windings as shown in the diagram.

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F.T.12

by the sweep generator from reaching the amplifiers.

When building the CRO it is essential to adequately insulate all high voltage points to prevent breakdown. It would also be a good idea to insulate the shafts of the spot shift controls from the chassis. The elements of these controls are 600 volts positive with respect to earth and it is just possible that an internal breakdown could occur. However, even if it did there would be no danger to the operator, but the equipment might be damaged.

If the controls are insulated with bakelite washers the chance of breakdown is virtually eliminated. To prevent any chance of a shock you may care to fill the grubscrew hole in the knob with wax so that it is impossible to make accidental contact with it. However, the possibility is very slight and we just mention it in passing.

FILAMENTS

With CRO's it is normal to earth the high voltage anode, and to make the cathode of the tube negative with respect to the chassis. This allows the deflector plates to be kept at or near earth potential and simplifies the problem of isolating the high voltages involved.

However, it was impossible to adopt this method with our design, as there is only one 6.3 volt filament winding available on the small transformer used, and the cathode of the 902 is tied internally to its heater.

This means that had the negative power supply been used, the heaters of all the valves would have to be made negative 600 volts with respect to the chassis. This would certainly have caused breakdowns to occur between the heaters and cathodes of the valves, which are never intended to be used under these conditions.

By adopting the positive type of power supply, however, it is possible to reduce the potential between the heaters and ground to approximately 50 volts positive. This voltage is not dangerous to the valve insulation, and actually reduces hum caused by heater cathode emission.

FOR VCR139

A glance at the circuit diagram will show that the high voltage anode of the CR tube is connected to a point on the voltage divider, which is approximately 600 volts positive with respect to the chassis. The deflector plates are returned to the moving arms of the spot shift controls and can be made plus or minus approximately 100 volts with respect to the anode. The cathode of the tube is returned to a point which is approximately 50 volts positive with respect to earth. The grid of the CR tube is connected to the moving arms of the potentiometer which forms the bottom of the voltage divider and adjustment of this control will alter the intensity of the luminous spot.

While on the subject of the voltage divider, the only alterations necessary to use the VCR139 instead of the 902 are to increase the .25 meg resistor between the spot shift con-

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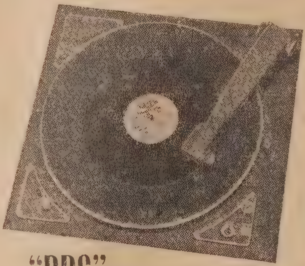

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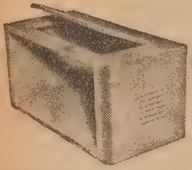

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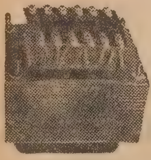

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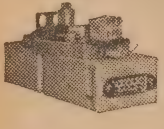

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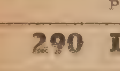

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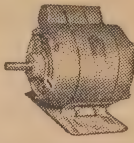

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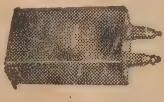

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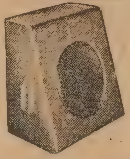

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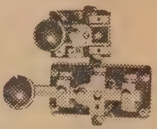

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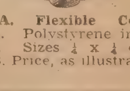

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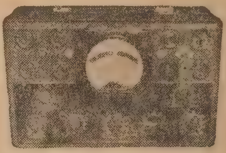

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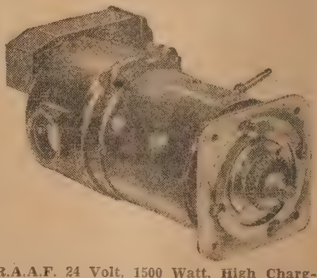

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trols and the focus control to .3 megohm, and to decrease the .1 megohm resistor between the focus and the intensity control to .05 megohm. A 2 ohm wire wound resistor must also be included in the filament lead which is not tied to the cathode to reduce the heater voltage to the required 4 volts for the VCR139.

A single filter condenser consisting of two 8 mfd 525 PV electrolytic condensers in series is all that is required to filter the high voltage supply. Equalising resistors of .5 megohm each should be connected across each condensers so that there is equal voltage drop across each. You will also notice that the anode of the tube is bypassed to earth through another pair of series connected electrolytic condensers. This gives extra filtering and also provides the AC return for the signal voltages supplied to the deflector plates from the amplifiers.

Equalising resistors are hardly necessary across this pair of condensers, as the voltage at this point is only about 600. However, if you are fussy about these points they may be included, The condensers used should never be of different makes.

FILTERING

It is also necessary to bypass the cathode of the CR tube to ground with another 8 mfd electrolytic condenser, as without this bypass severe hum trouble will develop in the amplifier valves.

The output from the low voltage rectifier is taken to the small filter choke which must have adequate inductance. This choke is bypassed with two 16 mfd electrolytic condensers. The large filter condensers not only give good filtering, but allow the half wave rectifier to deliver the highest possible output voltage. It would be worthwhile to increase the first of these filter condensers to 24mfd or higher to further increase the voltage output from the power supply.

The grid leads of the amplifiers must be short and kept away from heater wiring to avoid hum troubles. On no account should these grid leads be shielded. The outputs of the two amplifiers should be well separated, as also should the leads to the CR tube deflector plates. Any coupling between these leads will cause phase shift, which shows up as distortion of the trace, which becomes worse as the frequency is increased.

No condensers should be used with voltage ratings less than those shown in the circuit diagram if breakdown is to be avoided. Where the voltage rating is not marked either a 400 volt or a 600 volt condenser may be used.

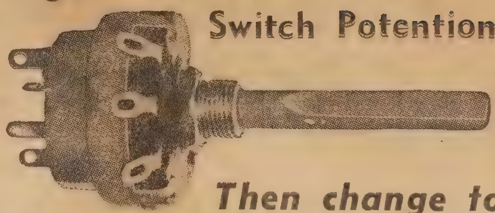
SHIELD

The CR tube should be enclosed in a magnetic shield to avoid deflection of the trace due to the power transformer field. This shield should preferably be made of MU-Metal, but if this is not obtainable a length of 2-inch diameter iron water piping may be used.

Make sure that the shield is not

Continued on Page 67

Having trouble with Switch Potentiometers?



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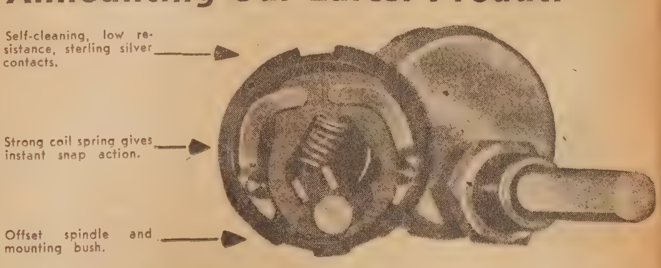
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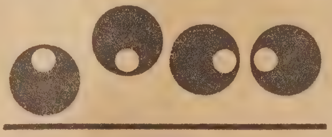

(Chassis)

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Here's your answer, Tom!

Writing in from Bondi, NSW, our "Tom" for this month says "I have been in the radio game for a few months only but have been bitten so hard by the bug that I have set my mind on becoming a technician." Here are just a few of the questions that at the moment stand between Tom and his ambition.

THE questions certainly do the technical round starting with shocking coils and ending up somewhere in a welter of F.M. and television. Let's get started then.

You know the shocking coil? Does it produce a-c or d-c and could it take the place of a vibrator?

Yes, Tom, we've seen some shocking coils in our time. In fact, we've wound some ourselves. Possibly the most shocking coil of all would be a rattlesnake under a rock. Its effect on one would certainly be electrifying!

However, to quit the fooling, you are apparently referring to a device which has been sold ever since our respective grandfathers were boys and credited with the ability to cure everything from sciatica to penury. Of course, they may have medical uses, but our main interest in them was to see who could hold the handles with the dial round furthest, without being tied into a reef knot.

The primary contacts of a shocking coil interrupt a supply of direct current from a battery and causes it to flow in bursts through the primary winding of the coil. This causes a magnetic field built up and down periodically and from this point onward the current becomes a-c. Leastwise that's what you feel when you grip hold of the handles.

In point of fact, a vibrator is somewhat similar except that the vibrating reed is more carefully designed and the contacts are of special metal intended to work for years and years—well, say 12 months, anyway. The transformer also is a husky device intended to give heavy current as well as a fairly high voltage from the secondary. The comparison with a shocking coil is rather like comparing a Rolls Royce with a flivver, only more so!

A synchronous vibrator goes a step further in that its secondary contacts rectify the a-c again and produce high voltage d-c capable of working your set. At the very least you would have to rectify the output from a shocking coil before it would work a receiver. Even then the set would not need to draw much current of else it wouldn't get the chance to, if you know what we mean.

What is a Beat Frequency Oscillator and what is CW Transmission?

Let's answer the second part of the question first.

The term CW means "continuous wave," and the expression infers that the signal emanating from the transmitter is completely pure and not in any way modified by imposition of tone of voice or music. Instead, the intelligence is conveyed purely by periodically interrupting the transmission with a Morse key.

In a receiver the transmission sounds like a series of clicks or plops and the only indication that the carrier is on is a slight hissing noise in between. To say the least of it, Morse code would be very difficult to read under these conditions. A good many folk believe, of course, that it's impossible to read, anyway!

To make the job easier, however, receivers are sometimes fitted with a special oscillator which generates a note at or very close to the intermediate frequency. This beats with the incoming signal and produces a whistle each time the carrier is radiated and silence at other times. This extra oscillator is called a beat frequency oscillator or more simply a "BFO"

How Does a Tone Control Work?

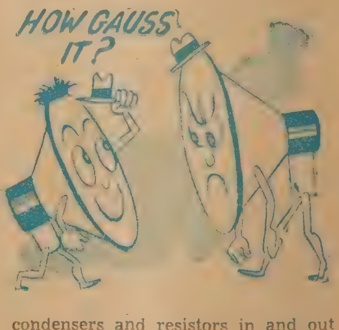
It might be better, Tom, to explain first what a tone control does to the music which emanates from your loud-speaker; or should we say the one in your set?

As you listen to your favorite programme, you may feel that the top notes are too loud and too strident and you would like to cut them back a trifle. On the other hand, you may be interested in violins (otherwise known as fiddles or scratch boxes) and wish to goodness you could quieten the drums. Well, the tone control on a radio does these things for you to a degree by altering the balance of the bass and treble.

In most radio sets the tone control progressively reduces the highs but gives the illusion that the bass is increased at the same time.

However, more complicated systems allow you to do almost anything independently with the bass and treble so that the radio becomes somewhat akin to a wurlitzer organ without the keys! Maybe there is a trace of satire in that remark.

Going back to the simple type of control, the usual stunt is to connect a condenser in series with a potentiometer between one of the audio plates and earth. This network does not interfere much with the bass response, but it attenuates the treble noticeably, depending on the setting of the potentiometer. The more complicated systems switch condensers and resistors in and out of circuits with the same abandon as a train controller. There we go again!


HOW GAUSS IT?

What are cps, dbs, gausses and what is frequency response?

Judging by those multi-barrelled questions, Tom, you've been poring over an audio article written by the Editor or one of his confreres, but on with the job—

The letters "cps" stand for "cycles per second" and the expression is mainly used in discussions of audio or audible frequencies. By way of example, the middle C string on a piano produces an audio note of approximately 250 cps. In other words, the mass and tension is such that it tends naturally to vibrate at a rate of 250 times per second, disturbing the air at this rate and producing a vibration which is interpreted by our ears as sound.

On the same piano the note C one octave higher would give a frequency of approximately 500 cps, while the next one up would generate about 1000 cps, and so on to the top of the scale.

Incidentally, 1000 cycles per second is equal to 1 kilocycle per second, abbreviated often to 1kc. Technical men, being generally lazy fellows, are more likely to say 3 kc, therefore, than 3000 cycles per second.

Your next abbreviation "dbs" is not quite right, the correct term being "db." It means "decibel," and is once again a term frequently used in audio work.

THE DECIBEL

The decibel is a purely fictitious unit, based on the logarithm of a voltage or a power ratio. If, under two given test conditions, the power output of an amplifier varies in a ratio of 2-1, it can be said to vary by 3db. This figure is obtained by taking the logarithm of two, which is .3010, and multiplying it by 10 to get the result of 3.01 db. Unless one wished to be highly accurate and academic, it would be sufficient to say 3db.

Decibels are also used, somewhat more loosely, to express voltage ratios and in this case it is necessary to multiply the logarithm by 20. Thus a voltage ratio of 2:1 produces a decibel figure of 6.02, or six decibels approx. There is nothing inconsistent between these two figures, since a change in power is proportional to the square of the accompanying change in voltage. A 2:1 change in voltage would mean a 4:1 change in power, and this again would equal 6db.

OUR EARS

You might reasonably ask, Tom, why I go to all this trouble when one can express ratios so easily. The point is, however, that our ears themselves are logarithmic in character and are very much more sensitive to changes at low level than at a high level. Thus, by inventing and using the decibel, a mathematical figure is made to bear a close relationship to the human ear.

The foregoing remarks will certainly not make you an expert on the subject of decibels, but they will at least give you an idea of what it is all about. Before one can hope to use the term it is necessary to have a good working knowledge of ratios, logarithms and so on.

Just to be quite sure of ourselves, we turned up the word "gauss" in a highly correct and technical dictionary. This helpfully told us that gauss is "the cgs electro-magnetic unit of magnetic flux density; it is equal to one line (or Maxwell) per sq. cm." Perhaps we should leave the definition rest there.

Sufficient to say that, in audio work, the gauss is most frequently involved in expressing the strength of a magnet fitted to a loud-speaker. The majority of modern speakers use magnets which give a flux density of about 9000 gauss on the pole face. However, the most expensive speakers have magnets which give double this flux and result in a much more efficient unit.

We already explained the basis of frequency response in the earlier paragraphs about cycles per second. An average specimen of the homo sapiens (women also) can hear audio frequencies between about 16 cps and 15,000 cps, represented by the lowest conceivable organ note on the one hand, and by the highest harmonics of instruments on the other.

In reproducing an orchestra by way of a microphone, record, amplifier, loud-speaker, &c., the whole system should ideally be equally sensitive to all frequencies. In other words, no part of the system should favor one band of frequencies or tend to reject others. Technically, the frequency response should be "level."

The very best reproducing systems come close to perfection in this regard but the vast majority tend to reject the extreme bass and treble and function well only on middle frequencies. From this arises our references to frequency response which is wide, medium, poor, or colloquially . . . perhaps we'd better not say it!

How do ac-dc sets work?

The main point about a receiver to operate on dc mains is that it cannot use a transformer, since transformers and dc simply do not mix. Obviously then, a set designed for either a-c or d-c work must avoid this very un-co-operative component.

In practice, one side of the incoming power mains is connected direct to chassis or to a busbar under the chassis which forms the B-minus return for the circuit. The other mains connection goes to a half-wave rectifier and thence through a filter system to the B-plus supply in the receiver. The rectifier passes current at all times but, on d-c, the set must be plugged in one way only—that which causes the positive voltage to flow through the rectifier to the receiver circuits.

As for the heaters, they are connected in series and run direct from the mains through a dropping resistor or a lamp acting as a ballast. The valves must have good insulation between heater and cathode and should have the same heater current rating.

Since there is a direct connection between the power mains and the receiver circuits great care must be taken in handling any ac-dc or d-c receiver, especially where there is any connection between the mains and the chassis itself.

In an ordinary a-c receiver the same problem does not arise, since

(Continued on Page 99).

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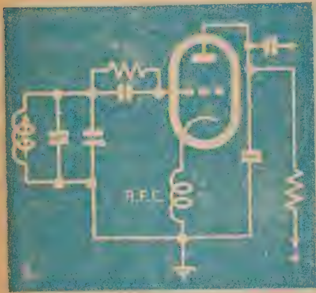
A COURSE IN TELEVISION

Continuing from our last issue, this instalment examines still other oscillator circuits and gives examples of tuning systems adopted by overseas television receivers. Means are suggested for pre-tuning single-channel receivers of the type likely to be manufactured locally.

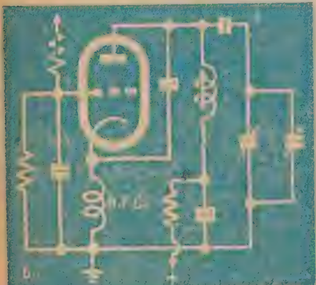
THE first portion of this article pointed out the advantages of the ultraudion oscillator and, in particular, its adaptability to two-terminal circuits. Its "appearance as a circuit is often altered drastically by changing the RF potential of the electrodes with respect to earth.

It is quite possible, however, to vary the arrangement of the ultraudion oscillator to bring either the plate or the grid to virtual earth potential and to have the cathode above earth, so far as RF is concerned.



Modified ultraudion circuit places a broadly resonant choke in the cathode return. It becomes a two-terminal oscillator with one side of the tuning circuit grounded.

Figure 5 shows one end of the tuning circuit earthed—an obvious advantage in certain switching arrangements. The plate is also bypassed to earth but the cathode is raised above earth potential for RF by inserting an RF choke in the return circuit. The choke must have characteristics which make it effective in the frequency range which the oscillator is intended to cover.



Yet another variation of the ultraudion has the grid "earthy," a choke in the cathode circuit and the tuned elements in the plate. It is used by some American television receivers.

Once these conditions are satisfied, the circuit behaves quite normally. The capacitance Cg-k forms a divider network with the capacitance between heater and ground. It raises the cathode above earth potential for RF and makes it behave in much the same fashion as if it were actually tapped part way up the tuning coil.

The similarity which develops between this circuit and the regular cathode tapped oscillator is immediately apparent.

Matters of temperature compensation, frequency drift, coil switching, &c., can receive precisely the same treatment as already outlined for the conventional ultraudion oscillator.

TUNED PLATE

Just the opposite approach is represented in figure 6, where the grid is shown bypassed to earth and the resonant components are placed in the plate circuit. As before, the RF choke is connected between cathode and earth.

A small condenser between plate and cathode raises its potential for RF and forms a divider with the capacitance across the choke and between cathode and heater. The cathode is thus virtually tapped part way up the tuned circuit (or coil) and the oscillator behaves normally.

One particular American manufacturer has employed this circuit extensively with a turret tuner which retains the single plate coil but shunts it with parallel condensers or coils as required.

The initial circuit is fundamentally resonant in the middle of the range. For low channels, the coil is simply shunted by a selection of variable condensers which reduce the frequency as required.

For higher frequency channels, parallel coils are switched into circuit, effectively raising the resonant frequency. Their inductance is varied over the necessary small range by the usual slugs.

OSCILLATOR CHECK

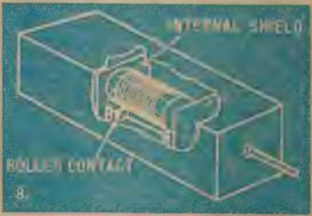
A further point of interest is that the same manufacturer brings out a 1-meg. resistor to an external test point, for ready checking of the oscillator valve. When the valve is operating normally, a certain deflection can be obtained from the end of the resistor, assuming a meter of stated range and sensitivity. The same scheme, of course, can be applied ready to most oscillators.

The circuits mentioned thus far represent possibly the most important and the basic ones, although many variations are obviously possible. The student must be prepared for unusual circuit arrangements and, indeed, for complete tuning systems which appear novel—at least to the newcomer on the television bands.

Although the discussion, just here, has been confined to oscillator circuits, any tuning system which is adopted for the latter must normally be extended also to take in the aerial and/or mixer grid circuit.

In a multi-band receiver therefore, a complete tuning system will normally be a two or a three-section affair, with one section to tune the oscillator and the remaining section (or sections), for the signal frequency circuits. The values of inductance and capacitance must be proportioned to provide a difference in frequency equal to the selected intermediate frequency.

While there is no need at this stage to study all the various commercial tuning systems in detail, a couple of typical US designs can serve as specific examples.



Illustrating the principle of the Mallory "Inductuner" which, in practice, gives complete single-control coverage from 44 to 216 Mc.

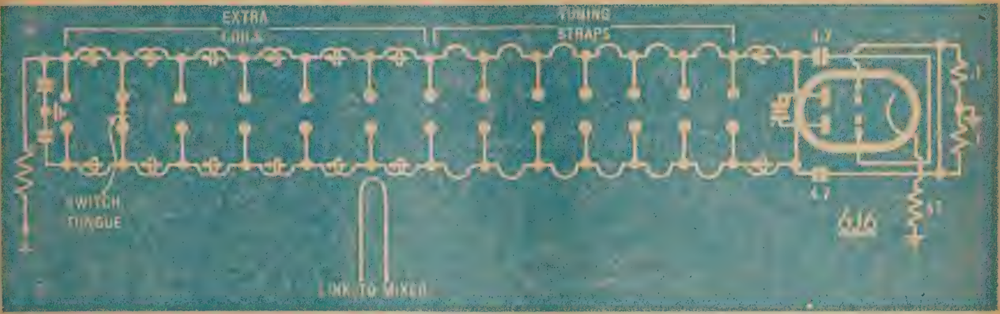
RCA television receivers have used a switched-tuned system with a push-pull oscillator differing from the circuits thus far mentioned.

The valve is a 6J6 and the grids and plates are cross-connected to produce regeneration.

SWITCH-TUNE

The tuning circuit is commonly referred to as a "quarter-wave" tuner, but the general appearance is remin-

LINE TUNER CIRCUIT FOR TELEVISION OSCILLATOR



The RCA tuner lowers the frequency in steps by using a switch to add capacitance and inductance to the basic tuned circuit. The mixer grid circuit is tuned by a similar arrangement.

iscent of a conventional coil box. It employs a rotary wafer-type switch and small amounts of inductance are wired between the respective contacts. As the switch is rotated through its various positions, more inductance is added to the line and the resonant frequency is reduced in steps, according to channel requirements.

Alignment on the respective channels is accomplished by brass and iron-dust slugs which operate on the segments of the inductance and by screws which lie close to the bonding straps and provide additional capacitive adjustment.

A slit stator condenser wired between the oscillator plates provides fine tuning, overcoming any innacuracies of setting up or frequency drift, Since the segments of the inductance are permanently in series, a special alignment procedure must be followed.

The complete tuner is built into a tuning bracket which is simply installed in the chassis as a unit, provided with aerial heater and HT supply and fed into the IF channel. Inside the bracket are six switch wafers, together with the required slugs and trimmers.

The Mallory "Inductuner," as used in Du Mont receivers is quite different in design. Three coils are mounted axially on the control shaft, but in different compartments. A small roller wheel makes contact with one turn of the coil and rotating the shaft winds the rolling contact from one end of the coil to the other.

The inductance is therefore varied continuously, giving a range from .02 to 1.0 microhenry and a tuning range of about 50 : 1. In practice, the 10-turn coils can be made to tune from 44 to 216 Mc. The unused portion of the coil is always shorted to relieve loss and absorption effects.

INDUCTUNER

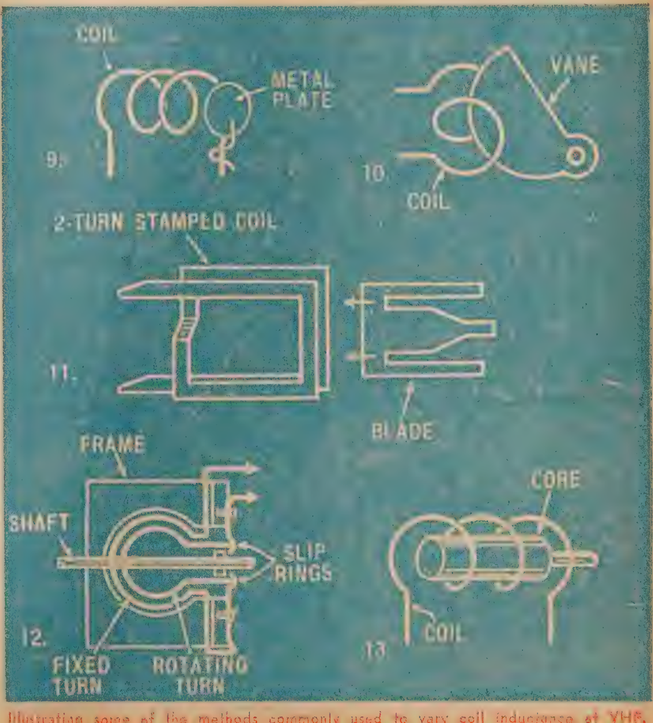
A complete inductuner assembly, as used by Dumont, carries three coils and mounting positions for three valves. A typical combination provides a 6J6 as grounded-grid RF amplifier, a 6AK5 pentode mixer and a 6J6 oscillator.

Although the position of Australian television is far from clear at the time of writing, it seems unlikely that there will be more than one station in any centre, at least for many years. However, since the definition standards are almost certain to be high—tentative figures are 625 lines, 30 frames—the propagation frequency must also be high. Our receivers will therefore combine the single channel principle from Britain with the high frequency techniques of the United States.

On this assumption the circuitry must involve miniature valves and separate oscillators, but there will be no need for involved tuning systems. Simple pre-aligned circuits will be adequate, with no more than a possible fine tuning control to offset frequency drift.

Some simple schemes for varying coil inductance were explained in the February, 1949 issue, in the series "Getting Started On FM." Since some of them will almost certainly appear in television receivers, further reference is justified.

Figure 9 shows a very elementary



Illustrating some of the methods commonly used to vary coil inductance at VHF.

Large Stocks Just Received of
HMV FREQUENCY RESPONSE RECORDS

ED1189 Side 1
50, 100, 250, 1000, 3000, 4000, 5000, 7000, 9000, 11,000, 13,000, 15,000, 17,000, 19,000 cycles.

Side 2
70, 160, 500, 2000, 3500, 4500, 6000, 8000, 10,000, 12,000, 14,000, 16,000, 18,000, 20,000 cycles.

ED1190 Same both sides
35, 50, 70, 100, 140, 250, 500, 1000, 2000, 3000, 4000, 5000, 6000, 7000, 8000, 9000, 10,000, 11,000 12,000, 13,000 cycles.

Graphs showing characteristics will be supplied with each record.

Each recording 9/- plus postage. Packing charge 1/6 for country and mail orders.

Also: DECCA *ffrr* RECORDINGS

EURYANTHE OVERTURE	K 1154
AMARILLI	K 2070
LA RONDE DES LUTINS ZEPHYR OP 35	K 1799
TELL ME LOVELY SHEPHERD THE LASS WITH THE DELICATE AIR	K 1686
UNA VOCE POCO FA — Janine Micheau	K 1659
SWAN LAKE BALLET—National Sym. Orchestra	AK 1308/9
BRANDENBURG CONCERTO NO. 5—Boyd Neel String Orch.	AK 1389/91
JOHN IRELAND SONATA IN D MINOR —Frederick Crinke	AK 1400/3
HAYDN SYMPHONY No. 88 in G MAJOR—National Sym. Orch.	AK 1472/4
BRANDENBURG CONCERTO NO. 4 —IN G—Boyd Neel	AK 1616/7
SYMPHONY NO. 5 IN D MINOR OP. 107 (Reformation)	AK 1715/8
CONCERTO IN ONE MOVEMENT FOR VIOLIN AND ORCHESTRA	AK 1822/3
SLEEPING BEAUTY BALLET SUITE—BBC Theatre Orchestra	AK 1524/5
MOTHER GOOSE SUITE — National Symphony Orchestra	AK 1342/3
LA FOLIA (Variation Serieuses)	AK 1670/1
DAMNATION OF FAUST	AK 1648/9
ELIZALDE: CONCERTO FOR VIOLIN AND ORCHESTRA	AK 1777/9
MIDSUMMER NIGHT'S DREAM	AK 1768/9
SCHEHERAZADE	AK 1966/7
MOZART: SONATA IN G MAJOR—Eileen Joyce	AK 1800/1
SCHEHERAZADE SYMPHONIC SUITE	AK 1980/5
BRANDENBURG CONCERTO NO. 5 IN D MAJOR	AK 1889/91
LE SACRE DU PRINTEMPS	AK 1727/30
LEIDER EINES FAHRENDEN GESELLEN	AK1624/5

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Victorian Factory Representative: John L. HARROWER, 71 Little Lonsdale St., Melbourne. Phone Central 8519.

A STANDARD SMALL C.R.O.

(Continued from Page 61).

magnetised, as any residual magnetism will deflect the spot.

With this CRO the black coating inside the bulb of the CR tube operates a high potential instead of earth potential, as with conventional negative HT supplies. If the magnetic shield placed around the tube is earthed, interaction between this shield and the electron gun takes place, which may interfere with the pattern on the screen. Therefore the shield should be mounted on insulating pillars. The insulation does not need to be particularly good, as there is no high voltage present on the shield.

CHECK CAREFULLY

When you have finished the wiring, check everything carefully. It is advisable to spend some time on this, as CR tubes are expensive items and a burnt screen due to a fault in the wiring can spell ruin for the tube.

After checking everything the intensity control should be turned completely off, the focus and spot shift controls set about half way and the unit switched on. Give the valves sufficient time to heat and then slowly advance the intensity control. If everything is OK a green spot should appear somewhere on the screen; it can be centred and focused by the use of the appropriate controls.

When the internal-external sweep switch is set to the internal position and the horizontal amplifier gain control advanced, the spot should form a line across the face of the tube. The tube can now be rotated until this line is horizontal. A word of warning—the intensity should always be kept low while viewing a spot or small stationary pattern to prevent the screen from being burnt.

TESTING

It should now be possible to connect a source of signal such as from the 50 cycle terminal to the vertical amplifier, and by setting the time base frequency controls and the synchronising control to observe a pattern on the screen. Don't be alarmed if the wave form of the 50 cycles is not good, as it is quite common for the wave form of a heavily loaded transformer winding to be poor.

One point worthy of mention is the method of mounting the VRC139 tube. This tube is not supported by its socket as is the 902 but must be held in place by a strap which firmly clamps the tube around the bakelite base. The tube is then supported by its base and by rubber packing inside the metal shield. The escutcheon around the tube, as shown in the picture, was salvaged from an old dial and is ideal for the VRC139. It may not be easy, however, to find a suitable escutcheon for a 902 but a small cowl could easily be made from sheet metal lined, where it touches the tube, with sponge rubber.

If you have constructed your CRO carefully you will have a most useful and versatile piece of test equipment.

POWER SUPPLY FOR YOUR CAR RADIO

MANY hundreds of our readers have built the Kar Set, which was described in the May '49 issue of Radio and Hobbies, and we have received letters from all over the country congratulating us on the design.

However, we occasionally receive requests from readers on adapting disposals genemotors for use with car receivers in place of the usual vibrator power supply. There are a number of suitable genemotors available through the various dealers at a very small cost.

One particular unit we have in mind is designed for 9 volts input but works well on 6 volts, delivering a high tension voltage suitable for the set.

The well-known wireless set No. 11 L.P. genemotor is a very reliable unit designed for 12 volts input. The output, allowing for the drop in cables and filters is in the vicinity of 180 volts. This is slightly lower than that for which the set was designed but in practice the lower voltage does not appear to affect the performance of the set to any noticeable extent.

The modifications to enable the genemotor to be used in a car are quite simple. The original case is quite sturdy and will probably not need modifications. It is somewhat larger than the vibrator case but this may not cause difficulty since it can be installed remote from the receiver proper. Use shielded wire for the connecting leads. Many English cars with a 12-volt system have the positive side of the battery earthed. Therefore, it is necessary to reverse the input leads to the genemotor. Do not interfere with the RF filtering, but change the leads over right at the genemotor. It is necessary, also, to reverse the polarity of the filter condensers on the primary side. The rest of the filtering inside the case may be retained.

A COURSE IN TELEVISION

(Continued from page 65)

scheme in which the inductance of a coil is reduced by bringing a metal disc close to the "earthy" end. There would be nothing precise about the adjustment, as illustrated, and the range would also be limited.

For more precise adjustment, the plate can be replaced by a metal vane which is rotated into the field of the coil and between adjacent turns.

Figure 11 shows the principle carried to its logical conclusion, and, as actually employed in an American FM tuner. The coil is formed by bonding two flat strips punched from brass—a method which gives high accuracy in production. The mutual inductance between the turns, and therefore the inductance as a whole, is varied by sliding into the coil a specially shaped blade.

Figure 12 shows another practical form of variable inductor adapted from the early "variometer." It is essentially a two-turn coil, with one turn rotating in respect to the other. As the control shaft is rotated, the magnetic fields around the individual turns either add or cancel, varying the total inductance over a wide range.

BUTTERFLY TUNER

This so-called "butterly" tuner has also been used in American FM receivers, and was often employed in wartime radar and IFF equipment.

As far as Australian receivers are concerned, however, it is likely that widest use will be made of the variable slug principle, as illustrated in figure 13. This is already widely used for broadcast coils and IF transformers.

At such frequencies, it is normal to employ special powdered iron cores, which tend to increase the inductance of the winding as they are introduced into it. Since it is possible at the same time to achieve the required inductance with fewer turns, it is also possible to build iron-cored coils of a given size with much improved "Q" factor.

As the frequency increases to say 20 or 30 Mc., losses in the core itself tend to overtake the advantage of having fewer turns, so that there may even be a loss of "Q" through its use. At this stage a variable iron core can be justified only on the grounds that it allows convenient adjustment of coil inductance. Naturally, however, the ultimate characteristics of the coil depend a good deal on the characteristics of the iron dust and its concentration in the moulding. Some powders are much better than others at these frequencies.

IRON LOSSES

Still higher in the spectrum the losses in typical iron dust cores become prohibitive and just the opposite approach is adopted. Solid or tubular brass cores are used, generally silver-plated. When these are inserted in a coil they progressively reduce the inductance. In practice it is possible to achieve ample range of control without incurring serious losses. The slugs may either be regular in shape or tapered to give a more gradual variation.

Slug tuning on its own would not normally allow full coverage, say, the US television band, but it is ample to align circuits on a specific channel. In the normal way, most of the capacitance in the associated signal circuits at least is that associated with the valves and wiring, and represents the irreducible minimum.

In oscillator circuits, as already explained, higher "C" circuits are commonly employed, the external capacitance often being temperature compensated.

PRICE'S RADIO 1950 BUYERS GUIDE

PAGE THREE

CONDENSERS, U.C.C. PAPER

0.002, 0.005, 0.01, 600V.	0	9
0.02 mF. 600V.	0	11
0.05 mF. 600V.	0	11
0.1 mF. 600V.	1	1
0.25 mF. 600V.	1	9
0.02 mF. 400V.	0	9
0.05 mF. 400V.	0	10
0.1 mF. 400V.	1	0
0.25 mF. 400V.	1	5
0.5 mF. 400V.	2	4
0.05 mF. 200V.	0	9
0.1 mF. 200V.	0	9
0.25 mF. 200V.	1	4
0.5 mF. 200V.	1	6
0.01 mF. 2000V. Working	2	3

RECTIFIERS

Westector. WX1. Permanent detector for crysal set	6	8
Westector. WX1. Ideal detector for small radios, monitors, wavemeters, etc.	6	8
Westalite. LT7W. For battery receiver filament supplies, Trickle chargers, etc. Output 6V. at 0.5 A.	8	7

"YORK" FOUNDATION KIT

You can build a mantel radio as modern as any commercial set using the "York" foundation kit. It includes a high-grade moulded cabinet with exclusive dial, chassis, gang condenser, speaker, aerial and osc. coils and filter choke.

£7/12/6

CONDENSERS BROADCAST TUNING

Roblan. Single Gang miniature	12	7
Roblan. Two Gang miniature	17	11
Roblan. Three Gang miniature	23	9
A.W.A. Single Gang	14	0
A.W.A. Two Gang	19	8
A.W.A. Three Gang	26	1
Presto. Two Gang "H" type	21	2
Presto. Three Gang "H" type	27	6
Polar. Two Gang miniature	17	6
Polar. Three Gang miniature	22	6

R.C.S. Midget Type

Cap:	Plates.	Single Bearing	Double Bearing
10 mmF.	2	4/-	7/3
15 mmF.	3	4/3	7/9
25 mmF.	4	4/6	8/4
35 mmF.	5	4/9	9/-
50 mmF.	7	5/3	9/6
70 mmF.	9	5/10	10/-
100 mmF.	14	6/6	11/3

EDDYSTONE MICRODENSERS

No. 476. 15 x 15 mmF. Split Stator	15	11
No. 583. 25 x 25 mmF. Split Stator	16	2
No. 580. 12.5 mmF. Double spaced	12	9
No. 582. 60 mmF. Single Section	15	2
No. 585. 100 mmF. Single Section	16	2
No. 586. 150 mmF. Single Section	16	7
No. 588. 27.5 mmF. Double spaced	15	6
No. 589. 54 mmF. Double spaced	15	6
No. 1094. 20 mmF. Double spaced	12	5
No. 1129. 40 mmF. Double spaced	13	9
No. 1093. 60mmF. Single spaced	14	7
No. 1130. 100 mmF. Single spaced	16	3
No. 1131. 160 mmF. Single spaced	16	11

UTILITY DIALS

A precision dial which is ideal for use on short-wave sets or test equipment. The silvered scale is 4" dia. and is finely graduated in degrees. A cursor with hair line makes accurate reading easy. The ratio is 60-1 as well as direct drive.

18/6

TRANSFORMERS, POWER

Ferguson

PF185. 150/150V. 30 mA. 6.3V. 2A.	24	0
PF106. 325/325V. 45 mA. 6.3V.-5V.	30	0
PF198. 285/285V. 50 mA. 6.3V.-5V.	30	0
PF151. 285/285V. 60mA. 6.3V.-5V.	34	0
PF165. 385/385V. 60 mA. 6.3V.-5V.	34	0

The following have two 6.3V. and one 5V. filament windings.

PF170. 285/285V. 80 mA.	39	10
PF168. 385/385V. 80 mA.	39	10
PF130. 285/285V. 100 mA.	46	0
PF160. 385/385V. 100 mA.	46	0
PF152. 285/285V. 125 mA.	56	0
PF181. 385/385V. 125 mA.	66	0
PF174 285/285V. 150 mA.	60	0
PF175. 385/385V. 150 mA.	70	0
PF173. 425/425V. 175 mA.	110	0
PF140. 385/385V. 200 mA.	111	0
PF171. 385/385V. 250 mA.	144	0
PF172. 500/500V. 200 mA.	144	0
PF107. 585/585V. 250 mA.	159	0
PF119. 240V. AC and 6V. Vib. supply	62	0
PF125. 240V. AC and 6V. Vib. supply	43	0

Other types available to order.

Henderson

325/325V. 40 mA. 6.3V.-5V.	30	2
285/285V. 60 mA. 6.3V.-5V.	32	3
385/385V. 60 mA. 6.3V.-5V.	32	3
285/285V. 80 mA. 6.3V.-6.3V.-5V.	35	6
385/385V. 80 mA. 6.3V.-6.3V.-5V.	38	2
285/285V. 100 mA. 6.3V.-6.3V.-5V.	38	2
385/385V. 100 mA. 6.3V.-6.3V.-5V.	45	2
285/285V. 125 mA. 6.3V.-6.3V.-5V.	45	2
385/385V. 125 mA. 6.3V.-6.3V.-5V.	55	9
385/385V. 150 mA. 6.3V.-6.3V.-5V.	66	2
385/385V. 200 mA. 6.3V.-6.3V.-5V.	107	3
240V. to 100V. Special Razor type	33	5
240V. to 110V. 20 watt	25	3
240V. to 110V. 25 watt	25	7
240V. to 110V. 60 watt	25	0
240V. to 110V. 75 watt	38	9
240V. to 110V. 100 watt	51	6

HOLE CUTTERS

A special chassis is easily made with a "Power" hole cutter. The tool is used in an ordinary brace and is adjustable from ¾" to 2¾". It can thus be used for meter holes as well as all the smaller ones. The cutter is replaceable and made of tool steel.

16/7

TEST EQUIPMENT

Calstan. D.C. Multimeter. 0-10; 0-05; 0-250; 0-1250 Volts. 0-1; 0-10; 0-50; 0-250 mA. 0-5000; 0-50000 ohms. With test leads	£7	11	2
Calstan. A.C./D.C. Multimeter. 0-10; 0-50; 0-250; 0-1000 A.C., D.C. and Output Volts. 0-1; 0-10; 0-50; 0-250 mA. 0-5000; 0-50000 & 0-500000 Ohms. Wtih test leads and portable carrying case	£10	16	2
Calstan Modulated Oscillator, for battery operation. Frequency range 160 kc. to 25 mc.	£17	1	3
Calstan Modulated Oscillator, for 240V. A.C. operation	£19	7	9
Calstan Valve and Circuit Tester. A complete multirange A.C./D.C. tester as well as an efficient valve tester. (A.C. operation)	£24	7	6
As above but for A.C. or 6V. vibrator operation	£27	1	2

TRANSFORMERS, VIBRATOR

Henderson. 6V. Input. 135V./20 mA. out.	21	9
Henderson. 6V. Input. 250V./60 mA. out.	25	8
R.C.S. 6V. Input. 135V./25 mA. out.	17	6
Ferguson. 6V. Input. 90V./15 mA. out.	19	6
Ferguson. 6V. Input. 150V./25 mA. out.	23	10
Ferguson. 6V. Input. 200V./60 mA. out.	25	0
Ferguson. 6V. Input. 250V./60 mA. out.	37	0
Ferguson. 12V. Input. 90V./15 mA. out.	21	8
Ferguson. 12V. Input. 150V./25 mA. out.	23	10
Ferguson. 12V. Input. 200V./50 mA. out.	25	0

Other sizes in vibrator transformers are available to order.

"DUNDEE" CRYSTAL SET KIT

Crystal sets have always been in demand and the "Dundee" is offered as a simple but efficient type. All the necessary parts are supplied except 'phones and aerial, and included is a drilled panel and wound coil. The instruction sheet is very easy to follow.

22/6

MICROPHONES

Acos. Crystal Insert. Make ideal microphones for clear cut speech	28	2
Dynamax. Low Impedance	117	6
Dynamax. High Impedance	145	0
Ellipsoid	92	6
Torpedo	142	6

POWER SUPPLIES

Van Ruyten "Portapac" is an AC operated supply for converting portable radios. Cannot damage the valves. Suitable for 3, 4 or 5 valve sets. No batteries need be used in the home	172	6
Ferguson "Vibrapower" will convert your battery set to a vibrator set. Easy to instal and very efficient	159	6

THIS IS THE SECOND 1950 BUYERS' GUIDE AND SHOULD BE USED IN CONJUNCTION WITH THE ONE PUBLISHED LAST MONTH AND ALSO WITH THE FINAL GUIDE WHICH IS TO APPEAR IN RADIO & HOBBIES FOR APRIL.

PRICE'S RADIO

5 & 6 Angel Place
SYDNEY

PRICE'S RADIO 1950 BUYERS GUIDE

PAGE FOUR

BOOKS

Philips' Valve Data Book. Details of local and imported valves	1	5

LAMPS

Radio Dial Lamps, 6V. or 2.5V.	1	0
Torch Bulbs. 2.5V. or 3.5V.	0	7
Torch Bulbs. Miniature 1.1V.	1	5
Torch Bulbs. Prefocus 2.5V.	1	5
Cycle Bubs. 6V.	1	3

Full range of household lamps and Auto head, side and tail lamps available.

TRANSFORMERS, SPEAKER

Rola. Type B.	19	3
Type C.	13	10
Type D.	12	6
Type E.	11	8
Type G.	12	0
Ferguson:—		
OP-1. 5000/2500 to 12/8/2 ohms.	39	10
OP-3. 10000/6600/5000 C.T. to 12/8/2 ohms.	65	1
OP-23. 3250 to 12/4/2 ohms.	65	1
OP-19A. 5000 C.T. to 12/8/2 ohms.	102	10
OP-25. 10000 C.T. to 8.4/2.1 ohms.	130	0

A large range of special output transformers can be supplied to order.

TRANSFORMERS, FILAMENT

R.C.S. TP1. 2.5V. 2A.	11	6
TP2. 4V. 1A.	11	6
TP3 6.3V. 1A.	11	6
TP55. 6.3V. 3A.	14	6

Filament transformers for most applications can be supplied to order.

TORCH SPECIAL

A torch is essential in every home, and a large purchase enables us to offer a standard size two-cell torch at a very low price. This is an English make and has an insulated barrel with brass fittings. The reflector is highly polished and throws a powerful beam of light. The torch is supplied complete with globe and two 950 cells.

5/10

COILS, BROADCAST

R.C.S. E356 Iron core permatune. Aerial	7	6
R.C.S. E537 Iron core permatune. R.F.	7	6
R.C.S. E536 Iron core permatune. Oscillator	7	6
R.C.S. T81 Reinartz without shield can	5	6
T82 Reinartz	6	6
T87. R.F. with React.	6	6
Q-Plus "01" 1R5 Osc: wound on ½ watt resistor	4	9
Q-Plus "02S" Midget Osc: shielded for 1R5	8	9
Q-Plus "03S" Midget Osc: shielded for 6J8	8	9
Q-Plus "05S" Midget Osc: shielded for 6BE6	8	9
Q-Plus "AC2S" Midget Aerial, shielded	9	6
Q-Plus "RC2S" Midget R.F., shielded	9	6
Q-Plus "RC6S" Midget, shielded Reinartz	9	6
Aegies. M9 Permatune Aer.	8	6
Aegis. M10 Permatune R.F.	8	6
Aegis. M11 Permatune Osc.	8	6
R.F.P. Unshielded Aerial	4	6
R.F.P.Unshielded Osc.	4	6
R.F.P. Unshielded R.F.	4	6

CAPTAIN AERIAL

Improve reception with the "Captain Aerial." This simple device eliminates the outside aerial and can be fitted to the radio in a few minutes. If you use an indoor aerial you will be amazed at the improvement, and when this unit takes the place of an outdoor aerial, static will be reduced. A good earth is desirable.

5/6

BRAMCO REPLACEMENT SPEAKER WINDINGS

Speaker	Core Size	Impedance		
Magnavox (Standard)	¾" x ¾" x 1 1-16"	2500	5	6
		5000	5	6
		7000	5	6
		10000	6	0
		15000	6	0
Magnavox (Midget)	½" x ½" x ¾"	2500	5	6
		5000	5	6
		7000	5	6
		10000	6	0
		15000	6	0
Rola 8"—10" Series	11-16" x 13-16" x 1"	2500	5	6
		5000	5	6
		7000	5	6
		10000	6	0
		15000	6	0
Rola 5"—6" Series	9-16" x 11-16" x ¾"	2500	5	6
		5000	5	6
		7000	5	6
		10000	6	0
		15000	6	0
Amplion 8"—10" (Standard)	¾" x ¾" x 1 1-16"	2500	7	10
		5000	7	10
		7000	7	10
		10000	9	11
		15000	9	11
Amplion 8"—10" (Midget)	9-16" x 9-16" x ¾"	2500	5	6
		5000	5	6
		7000	5	6
		10000	6	0
		15000	6	0
Amplion 5" Series (Midget)	9-16" x 9-16" x ¾"	2500	5	6
		5000	5	6
		7000	5	6
		10000	6	0
		15000	6	0
Jensen	¾" x ¾" x 1"	2500	5	6
Saxon		5000	5	6
Croydon		7000	5	6
Gulbransen		10000	6	0
Utah		15000	6	0
Saxon D10	7-8" x 5-8" x 1¼"	7000	6	0

CONDENSERS SIMPLEX MICA

50, 100 or 250 mmF.	0	7
400 or 425 mmF.	0	9
500 mmF.	0	10
0.001 mF.	1	1
0.002 mF.	1	9
0.003 mF.	2	3
0.004 mF.	2	6
0.005 mF.	2	11
0.01 mF.	4	5

ALUMINIUM PANELS

(Subject to variable supply.)

Best quality 18 gauge medium hard aluminium, in the following sizes only:—

6" x 8"	1	6	12" x 8"	3	0
12" x 12"	4	6	12" x 18"	6	9
12" x 24"	9	0	18" x 18"	10	0

CONDENSERS U.C.C. ELECTROLYTIC

500 mF. 12 Volt	5	3
25 mF. 40 Volt	3	1
10 mF. 40 Volt	2	9
8 mF. 350 Volt	3	9
8 mF. 525 Volt	4	0
16 mF. 525 Volt	5	5
8 mF. 600 Volt	4	6

(U.C.C. formerly Technico.)

PLUGS AND SOCKETS

Clix. Plugs. Short type	0	7½
Clix. Plugs. Long type	0	9
Clix. Sockets	0	7½
Keltron Midget, 4-pin plug	0	8½
Keltron Midget, 4-pin socket	0	8
Keltron. Bakelite Octal	0	8
Keltron. Mica-filled Octal	1	2
Miniature 7-pin Bakelite	1	0
Miniature 7-pin Mica-filled	1	6
Amphinol. Bakelite, 4, 5, 6, 7-pin and Octal	0	9
A.W.A. Miniature, 7-pin with shield and spring	3	[illegible]
Wafer Octal	0	[illegible]
Miniature, 2-pin plug and base for chassis mtg.	1	6
Standard Banana Plugs with sockets	0	6

SAPPHIRE NEEDLES

Why be continually changing needles in your pick-up, when a sapphire can be used? As well as the added convenience, improved results will be obtained. Sapphires can be obtained in the standard straight shank, trailer type for record changers or miniature type for lightweight pick-ups. Two brands are available:—

A.R.C.	**16/6**
Ferrocart	**9/9**

SWITCHES

Oak Wafer Types:—

1 Pole. 11 Position.	1 Section		7	9
	2 Section		12	5
	3 Section		17	1
1 Pole. 12 Position.	1 Section		9	3
	2 Section		16	3
	3 Section		22	0
2 Pole. 4 Position.	1 Section		7	7
	2 Section		12	3
	3 Section		16	11
2 Pole. 5 Position.	1 Section		7	7
	2 Section		12	3
	3 Section		16	11
3 Pole. 3 Position.	1 Section		7	7
	2 Section		12	3
	3 Section		16	11
4 Pole. 2 Position.	1 Section		7	7
	2 Section		12	3
	3 Section		16	11
6 Pole. 2 Position.	1 Section		9	3
	2 Section		16	3
	3 Section		22	0

Alpha Rotary and Toggle:—

2-Way Toggle	3	2
Double pole single throw Toggle	4	6
Double pole double throw Toggle	6	4
2-Way Rotary	4	6
Double pole single throw Rotary	6	0
Double pole double throw Rotary	7	4
Energo. Bakelite rotary single pole	2	3
English. NP. Toggle. Single pole	2	6
English. NP. Toggle. 2-Way	3	3
English. NP. Toggle, DP. ST.	3	6

Price's Radio carry the most comprehensive range of radio components in N.S.W. and if the goods required are not listed, please write for quotation. We will be able to supply you. ALL PRICES ARE NETT. PLUS POSTAGE OR FREIGHT.

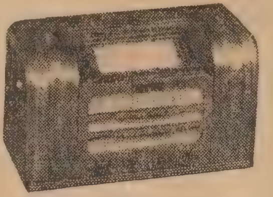
PRICE'S RADIO

5 & 6 Angel Place
SYDNEY

Brand new

BREVILLE 5-Valve DUAL WAVE RECEIVER with 5 spare valves and vibrator cartridge FREE

6 volt vibrator operated. Attractive walnut cabinet. Brand new, in original packing case. Ex-Amenities. 12 months written guarantee.



Weight packed, 70 lb.

Large, straight line tuning dial. Instruction sheet supplied with each model. 7-inch permagnetic speaker. Local, interstate and overseas reception.

OUR PRICE £29/10/- F.O.R.

USUALLY PRICED AT £45/17/6.

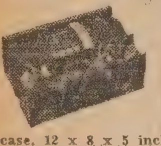
GENERATORS

24 volt 60 amp D.C. (F.O.R.). Each **£11/10/-**

Ideal for home lighting plants, battery charging, plating, etc. Also available Bendix voltage regulator and cutouts 30v. 50 amp. Brand New. Each **57/6**

Suitable for use with above generators.

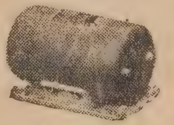
SCR 522 GENEMOTORS



28 volt input D.C., regulated and filtered output filtered D.C. 300 volts at .26 amps; 150 volts at .01 amps; 14.5 volts at 5.0 amps.

Completely shielded in metal case, 12 x 8 x 5 inches. Price, F.O.R. Each **45/-**

GENEMOTORS



Command type as illustrated, 28 volts, 1.1 amp. input. Output 250 volts, 60 mA.	32/6
14 volt input, output 220v. 70/80 mA. filtered	50/-
No. 11 type 12 volt input, output 350v. 40 mA.	30/-
12 volt input, output 480v. 40 mA.	35/-
28 volt input, output 330v. 135 mA.	65/-
28 volt input, output 550 v. 350 mA.	70/-

240V. 50 C.P.S. Transformers

375v. C.T., 375v. 100 mA. 5v. 3 amp., 6.3v. 3 amp. high voltage insulation	30/-
335v. C.T., 335v. 150 mA. 5v. 2 amp.	25/-
6.3 volt 1.5 amp.	12/6
240 volt and 20 volt X2 70 watts	15/-
350v. C.T., 350v. 150 mA. 5v. 2 amp.	15/-
275v. C.T., 275v. 40 mA. 6.3v. 3 amp.	13/6
240v.-110v. auto, 300 watt	37/6

FILTER CHOKES

150 mA.	20/-
100 mA. A.W.A. midgets	7/6

SPECIALS

TR1196 Transceiver, 3-9mcs. with valves, power supply, 12 volt, each	£8/10/-
TR1133 Transceiver, 100-124 mcs. with valves, less power supply, each,	£8/10/-
TR1133 Genemotors, 12v. input, output DC, 300v. 240 mA., 150v. 10 mA., 6v. 5A., filtered, each	£4/10/-
Type "S" Power Supplies, AT5-AR8, 240v. AC input, output DC, 250v. 80 mA., 550v. 200 mA., 300v. 100 mA., 12v. 5A.	£18/10/-
AT5 Transmitters wtih valves less power supply	£8/10/-
BC375 coil units, each	£3/10/-
TA12C 100 watt Transmitters less power supply and mod.	£14/10/-
108 MK2 Transceiver 6 to 9 mcs. with valves	£12/10/-
English I.F.F. Sets. Complete	£3/10/-
American I.F.F. Sets. Complete,	£4/10/-
W.E. F.M. receivers 29-40 mcs., 10 valves less power supply	£17/10/-
A.W.A. U.H.F. receiver 190-210 mcs. 11 valve less valves and meter	65/-
ZB2-ARR1 U.H.F. receiver 234-258 mcs. 4 valves, complete, new	£4/15/-
Used	£3/15/-
Bendix RAIODA remote control units. Each	35/-
24-volt solenoid 1 contact, 5 amp.	6/-
6-volt solenoid 1 contact, 5 amp.	6/-
4-pin wafer sockets, doz.	3/-
Aircraft S.P.D.T. toggle switches, ea.	2/6
Phone jacks and plugs, pair 2/-, ea.	1/-
Co-ax connectors pye type, pr 3/-, ea.	1/6
Vibrator "A" R.F. chokes, each	2/-
685 microhenry 500 mA. slot wound R.F. chokes, each	1/-
High to low impedance headphone adaptors, each	4/6
Variable tone buzzer transformer, ea.	3/-
Headphones, low impedance, each	8/6
Headphones, high impedance, each	17/6
Output transformers to low impedance headphones, each	5/6
Double button carbon microphones, each	7/6
Carbon throat microphones, each	7/6
Carbon microphone inserts carbon diaphragm, each	2/6
Dynamic No. 7 microphone inserts, each	6/-
Shielded hook-up wire, per yard	8d
Rubber covered stranded hook-up wire, per 100ft.	5/-
Westectors, each	4/6
Ceramic Formers, 6 x 1½ inch dia. ea.	3/6
Ceramic Formers 6 x 3 inch dia. ea.	5/-
Full wave bridge copper oxide rectifier, 100 mA., each	3/6
Half wave selenium 5 mA. rectifier, each	2/6
1 inch ceramic standoff insulators, ea.	1/-
¾-inch lead through insulators, each	1/-
Pressure gauges 2½ inches, 3000lb sq. inch, each	25/-

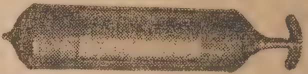
DISPOSAL VALVES, TESTED

1K7G	8/6	852	25/-
3Q5GT	10/-	954	12/6
6AC7	14/-	955	12/6
6AG7	20/-	956	12/6
6B6G	10/-	9001	10/-
6H6GT	7/6	12A6	10/-
6SH7	8/6	12SG7	10/-
6SH7GT	8/6	12SK7	10/-
6SL7GT	12/6	12SR7	10/-
6SN7GT	14/-	EA50	7/6
6U7G	10/-	CV6	2/6
7193	8/6	VT90 Micropop	10/-

NEW VALVES

1D8GT	15/-	7A6	10/-
6AK5	17/6	7C7	11/6
6B6G	12/6	7F7	11/6
6B8	15/-	83V	11/-
6B8G	12/6	811	70/-
6F6	15/-	813	70/-
6G8G	12/6	828	35/-
6H6	10/-	832	70/-
6J5G	11/-	837	25/-
6J7G	12/6	866A	25/-
6K8G	12/6	879/2 x 2	15/-
6SQ7	12/6	1293	11/6
6U7G	12/6	1294	11/6
6V6GT	12/6	VR54/EB34	5/-
6X5GT	12/6	VR65A	5/-

FIRE EXTINGUISHERS



Auto type. One quart capacity. Carbon tetrachloride. Pump action. A necessity for cars, trucks, caravans, yachts, factories, homes, etc.

Price, each **20/-**

Packing and postage: N.S.W., 2/-; Qld., Tas., Vic., 3/6; S.A., W.A., N.T., 5/-.

COAXIAL CABLE

Polystrene Insulation.

PS 29/M 72 ohm, 60ft lengths only 7-16 inch O.D.

PS 11/M 72 ohm, 60ft lengths only, 5-16 inch O.D.

Price, per length **30/-**

Packing and postage: PS 29/M, N.S.W., 2/-; Qld., Tas., Vic., 3/6; S.A., W.A., N.T., 5/-.

PS 11/M, N.S.W., 1/6; Qld., Tas., Vic., 2/6; S.A., W.A., N.T., 3/6.

MEGGER MINOR

500 volt. Plastic case. Complete in leather carrying case. Sizes 3½ x 3½ x 6 inches.

Price, each **£12/10/-**

Packing & registered post: N.S.W., 2/6; Qld., Tas., Vic., 4/-; S.A., W.A., N.T., 5/6.

PAPER FILTER CONDENSERS OIL FILLED

5 plus 5 mfd. 400 V.W.	8/6	1 mfd. 2000VW	10/-
8 mfd. 1000VW	25/-	1 mfd. 1000VW	5/-
8 mfd. 750VW	7/6	0.5 mfd. 6000 VW	15/-
5 mfd. 350VW	5/-	0.5 mfd. 3500 VW	7/6
4 mfd. 1000VW	15/-	0.5 mfd. 200VW	1/-
4 mfd. 500VW	6/6	0.25 mfd. 3000 VW	7/6
4 mfd. 400VW	6/-	0.25 mfd. 1000 VW	2/6
4 mfd. 200VW	3/-	0.25 mfd. 200 VW	1/-
2.5 mfd. 700VW	5/-	0.1 mfd. 3500 VW	5/-
2 mfd. 2000VW	22/6	0.1 mfd. 2000 VW	3/-
2 mfd. 1800VW	20/-		
2 mfd. 1000VW	12/6		
2 mfd. 400VW	3/-		
2 mfd. 350VW	2/6		
2 mfd. 200VW	2/-		
1 mfd. 3500VW	15/-		

ELECTROLYTIC TYPES

1000 mfd. 12 PV	2/-	200 mfd. 100PV	4/-
500 mfd. 100PV	7/6	35 mfd. 350PV	2/6
		50 mfd. 50PV	1/-

ELECTRONIC EQUIPMENT CO.

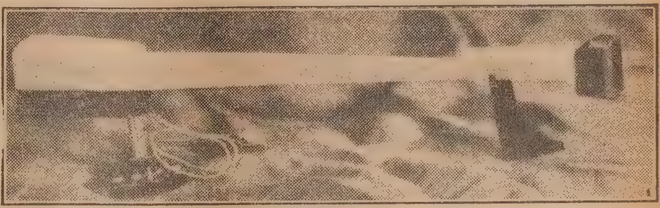
Please add exchange to all cheques. Make money orders and postal notes payable at Lewisham. Sorry, no C.O.D.

LM3555—29B West St., Lewisham, Sydney. OPPOSITE END OF LEWISHAM HOSPITAL (ADJOINING RAILWAY LINE) **LM3555**

TRADE REVIEWS AND RELEASES

NOW AVAILABLE—THE ACOS MICROCELL PICKUP

Amplion (A'sia) are expecting almost immediately a shipment of the new Acos GP20 "Microcell" pickups. Designed as a "pickup for the masses," it brings the advantages of a lightweight design without the complications of bass boosting and preamplification.



The Acos Microcell pickup.

THE GP20 employs a crystal element, which accounts for the high electrical output and the naturally rising bass response. The sample submitted to Radio and Hobbies for test gave a measured output of 0.72 volt at 1000c/s from a standard test recording (HMV ED1190). Peak output on typical discs would be considerably higher than this, so that there would be no question of the pickup driving any standard receiver or amplifier to full output.

HUMIDITY PROOF

The element is claimed to be proofed against the effects of humidity, the head also containing a moisture-absorbent chemical to give further protection to the crystal element.

Employing a cantilever movement, the stylus is a minute piece of sapphire on the end of a lever which protrudes in front of the head. A stationary leaf on either side of the stylus arm protects the latter from damage if the pickup is accidentally dropped on to the record. The arrangement, incidentally, makes it easy to place the stylus in a particular groove for record-spotting purposes.

NEEDLE CHATTER

Needle chatter is noticeably lower than from most other pickups and weight on the needle point very light.

The head clips into place and is simply replaced as a unit when the stylus point is worn out. Retail price for a new head is £2/15/-. The standard head has a stylus with a 2.5 mil. tip radius but a 1 mil. radius point will be available for microgroove recordings.

RETAIL PRICE

The complete pickup retails for £4/17/6 and will be available through trade houses. Distributors are Amplion (A'sia) Pty. Ltd., 36 Parramatta Road, Camperdown, NSW.

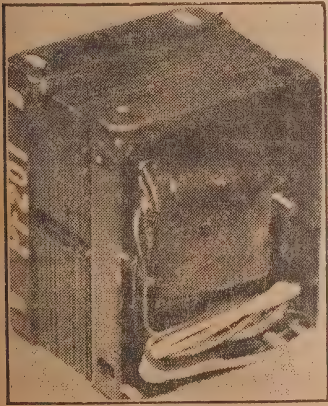
On test in the Radio and Hobbies laboratory, a sample GP22 produced excellent waveform throughout its range, except at the very low frequencies where most pickups tend to produce a somewhat triangular waveshape.

Referred to a reference level at 1Kc., the output at 50 c/s was at 0 db. The curve showed a gradual rise to a maximum of plus 5 db. at 500 c/s, falling to 0 db. at 1 Kc. It was 1.4 db. down at 3 Kc. rising to a minor peak at 6 Kc. The response thereafter reverted to approximate reference level, falling away rapidly beyond 10 Kc.

Compact Ferguson PF201 Transformer

Latest release from Ferguson Transformers is the compact PF201 unit, which has already been used in two Radio and Hobbies designs.

THE transformer was originally designed to suit the R & H "Cornerset" but it has an obvious appeal to the constructors of all small receivers and amplifiers.



On the same core as the earlier "P-30," the new transformer has the same overall dimensions — approximately 3 x 2¼ x 2½ inches. It is assembled in an open framework and may be mounted in a variety of positions on the chassis.

The primary winding is 240V, AC only, and the secondary is rated at 250 volts either side of the centre tap at a nominal load current drain of 50 milliamps. This assumes the use of a condenser input filter and a 6X5-GT rectifier.

The filament winding is rated at 6.3 volts, 2 amps., being sufficient to cope with most small receivers and amplifiers. Heating under full load current is moderate and even small overloads do not appear to trouble the transformer, given reasonable ventilation.

Retail price is 29/11 and stocks are available through most trade houses. Trade enquiries to Ferguson Transformers, Ferguson Lane, Chatswood, NSW.

Steane's Studio Mike

Steane's Sound Systems of 60-80 Miller St., Melbourne and 367 Kent St., Sydney announce the release of a professional studio type velocity microphone. Designated the "R47" the new microphone is of robust construction and features such refinements as a shock mounted movement, a magnetically shielded transformer and facilites for tilting to alter the pick-up pattern.

THE response of the microphone is within plus or minus 3db from 30 cycles to 12,000 cycles, and there are no peaks with an amplitude of greater than 2db within the range.

When tested with a good quality recording machine the microphone proved to be an excellent performer and appeared to justify all claims made for it.

The microphone can be obtained in all popular impedances, such as 50, 200 and 500 ohms, and is normally fitted with 20 feet of twin microphone cable. The finish is Florentine Bronze.

All inquiries with regard to the microphone should be forwarded to Steane's Sound Systems at either of the above addresses.

Homecrafts PTY. LTD.

Greater BARGAINS FOR THE RADIO ENTHUSIAST

CRYSTAL PICK-UP

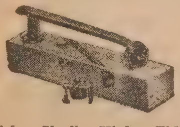
B.A.I
Replacement

High Fidelity Crystal Pick-up Heads. BA1 Pick-up heads suitable to replace all Garrard or Collaro magnetic pick-ups. When ordering, please advise if required for Garrard or Collaro pick-ups. **Price, 45/- each.**

B.A.I
PIEZOTONE
Genuine Sapphire
PLAY BACK NEEDLE

Improve Your Phono Radio with the best and lowest priced sapphire needle on the market. The new British B.A.1 Sapphire needle with over 2000 playings guaranteed. **Price only 9/9 each.**

MOVING COIL PICK-UP



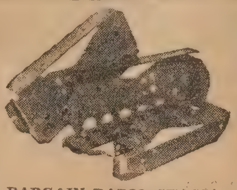
English Shefi High Fidelity Moving Coil Pick-ups. Complete with matching transformer . As illustrated. **Reduced from £4/19/- to 59/6.**

RECORD CHANGER

English Collaro Record Changer. The new English Collaro record changer. Type RC.49. This modern streamlined record changer is fitted with a high fidelity crystal pick-up and will change eight 10" and 12" mixed records. Price, as illustrated, **only £14/8/6, complete.**

ELECTRIC MOTOR

ELECTRIC MOTOR BARGAIN. The new "Collaro" rim drive electric motor with high fidelity crystal pick-up. As illustrated. Price, £7/1/-.



BARGAIN RADIO CHASSIS. 5-V. steel-drilled ducoed chassis. As illustrated, **1/11 each or 19/- dozen.**

ALUMINIUM CHASSIS

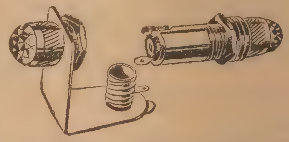
as illustrated

No. 1, 12" x 7" x 2", without ends	8/-
No. 2, 13" x 7" x 2½", with ends	9/9
No. 3, 7" x 5" x 2½", with ends	6/6
No. 4, 6" x 4" x 2", without ends	3/8
No. 5, 13¼" x 10" x 2½", with ends	12/3
No. 6, 8" x 5" x 2½", with ends	7/2
No. 7, 10" x 6" x 2½", with ends	8/4
No. 8, 17" x 10" x 3", with ends	17/5
No. 9, 13" x 7" x 2½", with ends	9/-
No. 10, 13" x 10" x 26", with ends	11/6

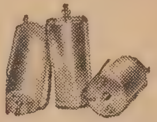
VAN RUYTON VIBRATOR UNITS

With filtered direct current output. Models available:—

VP6150	6V., 150V., 15 Ma.	£6/8/6
VP6150	6V., 150V., 14 Ma.	£6/8/6
VP6250	6V., 250V., 45 Ma.	£6/10/-
VP12250	12V., 250V., 45 Ma.	£6/10/-
VP32250	32V., 250V., 45 Ma.	£6/13/6



E.M.A. Type F (Faceted Jewels), wide vision type with nut and sacer for ½" hole mounting, **1/9 each. With Back** loading pilot light assembly, **3/9 each.** Front loading type, **6/- each.** Colours: Red, Green finish, Nickel-plated.

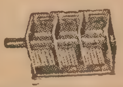


Brand new genuine Kingsley IF Transformers. 455 KC latest type. Reduced from 13/9 to 6/11.

BARGAIN PICK-UP CARTRIDGES. Genuine Cosmocord crystal pick-up cartridges. Reduced from 31/- to 9/11.

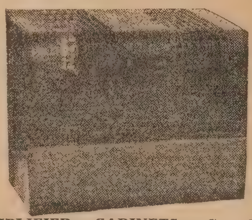
BARGAIN TUNING CONDENSERS

Midget 2 and 3 gang.



2 gang with trimmers. Reduced from 19/- to 8/11.

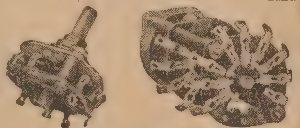
3 gang with trimmers. Reduced from 24/- to [illegible]2/11.



AMPLIFIER CABINETS. Complete with chassis. Small size for up to 15 watt amplifiers, 60/-. Large size for up to 30 watt amplifiers, 72/9.

CAPITOL TRAVERSING GEARS. Overhead Traversing Gears for recording from 8" to 16" discs. As illustrated, 5 Gns.

Super Pick-up Bargains. TRU-TRAK MAGNETIC PICK-UP. The famous Tru-trak Magnetic Pick-up with curved counter-balanced tone arm and off-set head. As illustrated, reduced from 70/- to 14/11.



WAVE CHANGE SWITCH BARGAIN.

Single Bank Oak Double Sided.

6 x 2 switches	2/11
2 bank 3 x 3	2/11
2 bank 6 x 2 single sided	2/11
4 bank band spread type	3/11

Country and Interestate Clients Add Freight or Postage.

Test Meter Bargain. Dual reading voltmeter. 0-20 V., 0-200V. Complete with leads, as illustrated. Price 22/6.

290 LONSDALE STREET, MELBOURNE — CENT. 4311

THE NEW KITSET

FROM time to time the production of a kitset of parts for making radio receivers seems to stage a revival. Most radio dealers regularly supply such kits for Radio and Hobbies sets, but occasionally a manufacturer comes along with one of his own.

Some years ago the kit business reached considerable proportions and some very fine jobs were made up particularly by the old Radiokes firm under Mr. Keith Stokes.

However, there have been big changes in the world since then and mainly because of the disorganised production of parts during the war, home-building has virtually rebuilt itself.

We were, therefore, most interested to come across a new factory-made kitset from George Choules, 20 Donald Street, East Malvern, Victoria.

Actually there are two kitsets, No. 1 containing the parts to make a variety of crystal sets, and No. 2, which, when added to No. 1, will allow a valve to be added.

Both kits come with a number of circuits and blueprints, together with explanatory matter on how to build them up. A good deal of care has been taken in the preparation, and we were most favorably impressed with the complete and clear instructions.

The demand for simple radio circuits and sets has never varied from the early days of radio, and every additional radio-minded boy sooner or later is looking for just what TRIX Hobby-kit seems to provide. We have not yet had a chance of thoroughly examining the kits, but, from information supplied, they look to be very promising lines for any radio or hobby shop.

Distributors for Cyldon

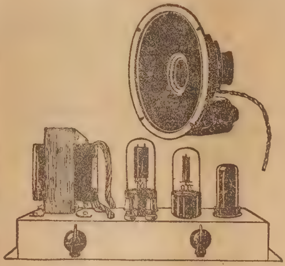
Messrs. J. H. Magrath of 208 Little Lonsdale St., Melbourne announce that they have been appointed Australian agents and distributors for the well-known English "Cyldon" condensers.

THESE condensers are available in a wide variety of types including:—An extensive range of SLC, SLF, Square Law and Logrithmic receiving and transmitting types. The transmitting condensers can be obtained in single or split stattor types with either ceramic or mycalex insulation and in capacities up to 1500 pF. They also have an extensive range of air trimmers including types suitable for VHF work and special types for mounting in coil or IF transformer cans. These have a variety of mountings and are made with ceramic insulation.

£31/-/- FOR THIS 8-VALVE DUAL-WAVE RADIO

Here's Value only to be found at Radio House. This ready-wired and tested chassis is complete with valves and 12" Rola Speaker.

Complete in every detail, it's easily fitted into your radio cabinet and can be supplied with a polished wood front panel. Ideal for overseas short-wave reception, fitted with Phono pick-up terminals and has tone controls for treble and bass boost
DIMENSIONS: 16"w. x 10½"d. x 9"h. Panel 16"w. x 10"h. Weight, packed in crate, 63 lbs.
Front view with panel attached.



POWER AMPLIFIER — 240 VOLT A.C. MAINS OPERATED

3-valve amplifier with 6" "Rola" speaker suitable for amplifying records in conjunction with a phonograph pick up—3 watts output. Size of unit without speaker 9" x 4" x 6". Weight 8lbs.

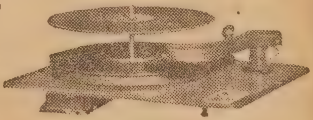
Plus freight **£9/17/6**

PORTABLE RADIO SET

5-valve b'cast model complete with batteries and valves, housed in beautiful leatherette carrying case **£19/10/-**
This set is suitable for country districts where reception is difficult, as it is super sensitive.

Complete with Motor and Pick-up

REDUCED FROM **£18/10/-** TO **£10/17/6**



It's a Special Purchase — but hurry before they go!
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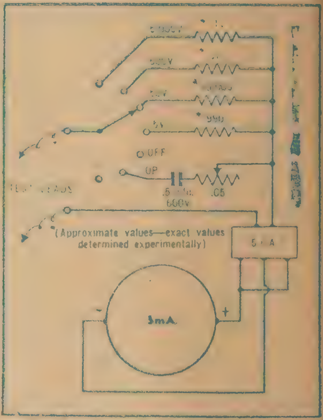
A READER BUILT IT!

Gadgets and circuits which we have not actually tried out, but published for the general interest of beginners and experimenters.

A.C. VOLTMETER FROM DISPOSALS PARTS

Another of our readers to make use of disposals parts in test instruments is Mr. W. Breinl of Kirribilli, Sydney, who recently sent in the suggestion published in this page for an A.C. voltmeter and output meter. Mr. Bailue has some suggestions to offer concerning 32 volt lighting plants.



The meter circuit is particularly simple. A suggestion for obtaining the multiplier values from ordinary resistors is given in the text.

THE meter Mr. Breinl used has a 5.0 mA. movement. Many similar meters have been available from Disposals recently at the cost of a few shillings each.

The copper oxide rectifier, also, is an ex-Disposals unit and is rated at 5mA. Do not use high current rectifiers since their characteristics at low currents are not likely to be linear. The only other major component required is a single pole switch with at least five positions.

All components can conveniently be mounted in a small wooden or metal box. A pair of test leads may be permanently wired to the instrument if desired since the switch makes all the range changes. It is often desirable to have separate meters for A.C. and D.C. This scheme has advantages over a single meter covering all ranges. The output range is adjustable for sensitivity and will cover all normal receiver alignment jobs.

CALIBRATION

To avoid soldering each time a receiver is aligned, a special plug to facilitate the reading of output can be made up as follows: Obtain an old octal valve base and cement an octal socket on top of it after having connected all corresponding leads and brought out leads from pins 3 and 4. These are the plate and screen pins on a normal octal based output valve. If desired, the plug and its connecting leads may be made a permanent attachment to the meter by soldering the leads directly to the output range at the switch. In service, the plug is inserted into the output socket, and the valve plugged into the socket on top.

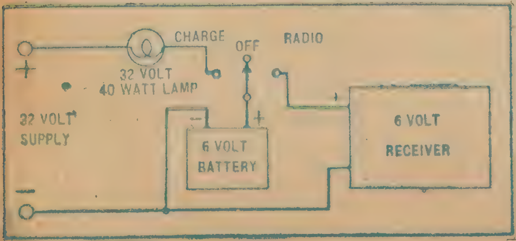
The calibration of the instrument is likely to be a problem to many. Undoubtedly the best method is to borrow a meter known to be accurate and do the job by the comparison method.

OUTPUT METER

Mr. Breinl suggests an alternative and also a method of obtaining the exact value of the multipliers without expensive low tolerance resistors. He writes: "I used a multiplier of rather larger value than necessary for each range and shunted it with a high value resistor until the reading on the meter corresponded with the voltage applied across the leads. The voltages were taken from an ordinary 385v/6.3v/5v transformer. Using this method, any meter can be used and low tolerance resistors are not necessary."

We would point out that mains voltages are subject to variation in certain cases and that even transformers are not always as accurate as they might be. However, the method is worth considering where more accurate standards are unavailable.

Mr. Bailue, of Waverley, is one of our readers who has come up against the problem of operating existing battery receivers from 32-volt home lighting supplies. He suggests that a separate battery be provided for the radio and that this battery be charged from the main bank of batteries through a 32-volt lamp. This is to be preferred to tapping into the 32-volt bank, not only because of the uneven drain, but because the voltage of the cells on charge is likely to rise a good deal about the nominal figure.



The addition of a switch and a lamp enables a 6 volt radio battery to be charged from a 32 volt lighting plant.

Cathode-heater type valves are ruggedly constructed and are capable of withstanding these overloads without damage, but filament type valves react very unfavorably.

The six-volt battery may be connected either through the limiting lamp to the batteries for charging, or to the radio when it is required. If the switch is left in the centre position, the six-volt battery is disconnected from the circuit.

Mr. Bailue's drawing suggests that he used a knife switch, but a three-position wafer switch may be used as an alternative. In this case, no connection is made to the centre contact. Most switches will be able to handle the current as the maximum is likely to be about two amps drain taken by the radio.

The radio battery can be kept in order by leaving it in the "charge" position for two or three nights a week as required. Naturally, this method is somewhat wasteful of power since more is actually dissipated in the lamp than charges the battery. However, it may often work out cheaper than buying a new 32-volt radio.

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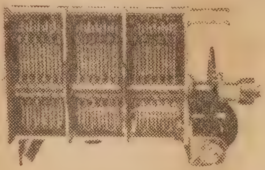

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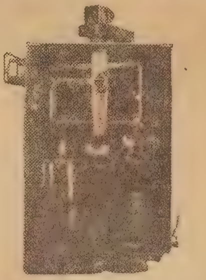

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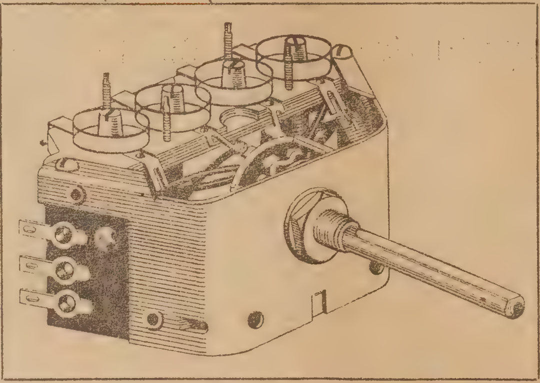
Watch for other "Q-Plus" 1950 releases —Support Australia's progressive Radio Components firm— First with midget coils, etc, and first with all worth-while developments.



Illustrated approximately life size—the new “Q-Plus” midget Dual Wave Bracket

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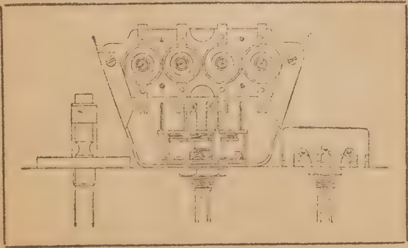

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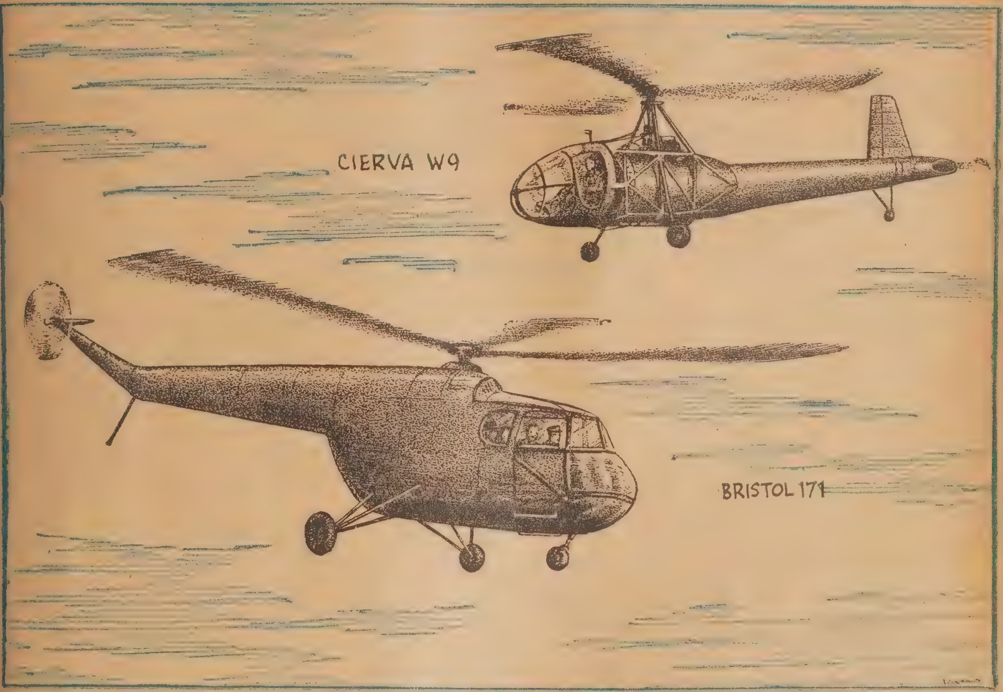
BRITISH HELICOPTER ENTERPRISE



With a history dating back beyond the achievement of heavier-than-air flight, the helicopter principle exercised the minds of experimental aeronauts and designers long before a practical rotating-wing aircraft was successfully developed.

THE autogiro, in which the normal type of propeller is used to give forward thrust while the freely-rotating blades give lift, was perfected more than two decades ago. The true helicopter, in which the engine-driven rotor provides both lift and forward propulsive effort, was developed during World War II, but progress has been rapid.

Offering amazing manoeuvrability, the helicopter has been shown to have a special place in aerial transport, and in Britain a wide extension of the experimental helicopter-mail service already established is expected.

In the production and use of helicopters, the United States of America is at present the world leader, but Britain has built a number of interesting machines over recent years. The initiative shown by British designers is an encouraging sign, and the adaptations that have appeared are an indication of the wide variety of form that rotary-wing aircraft can take.

Two interesting British designs are illustrated—the Cierva W.9 (above right) and the Bristol 171 (lower left).

The Cierva W.9 was built in 1947 as an experimental type, but it did not prove up to expectations. It provided valuable data and the novelty of its basic principle made it of special interest, however.

The W.9 employed jet thrust in place of the more orthodox anti-torque rotor. The jet came from a large pipe bent outward from the end of the fuselage

FLYING DRAINPIPE

Nicknamed the "flying drainpipe" because of this arrangement, the Cierva W.9 was not developed beyond the experimental stage since the exhaust-jet principle did not prove successful, and the Cierva Company, which was founded in 1926, has now turned to the development of other types of helicopter, including the Cierva Air Horse (previously described) and the Cierva Skeeter I.

The second machine illustrated, the Bristol 171, was the first practical British-designed commercial helicopter to fly, and it is now a firmly-established production type.

The 171 first flew in 1947 powered by a 450-horsepower Pratt and Whitney Wasp Junior engine. Later models have been equippd with the British-built Alvis Leonides engine.

The layout is the well-proven type with a single three-blade main rotor and a small rotor, set on the side of the rear of the fuselage, to counteract torque.

Intended for use as an air-taxi-mail-carrier, feeder-line aircraft, or for rescue work and artillery spotting, the 171 has accommodation for four, including one or two pilots.

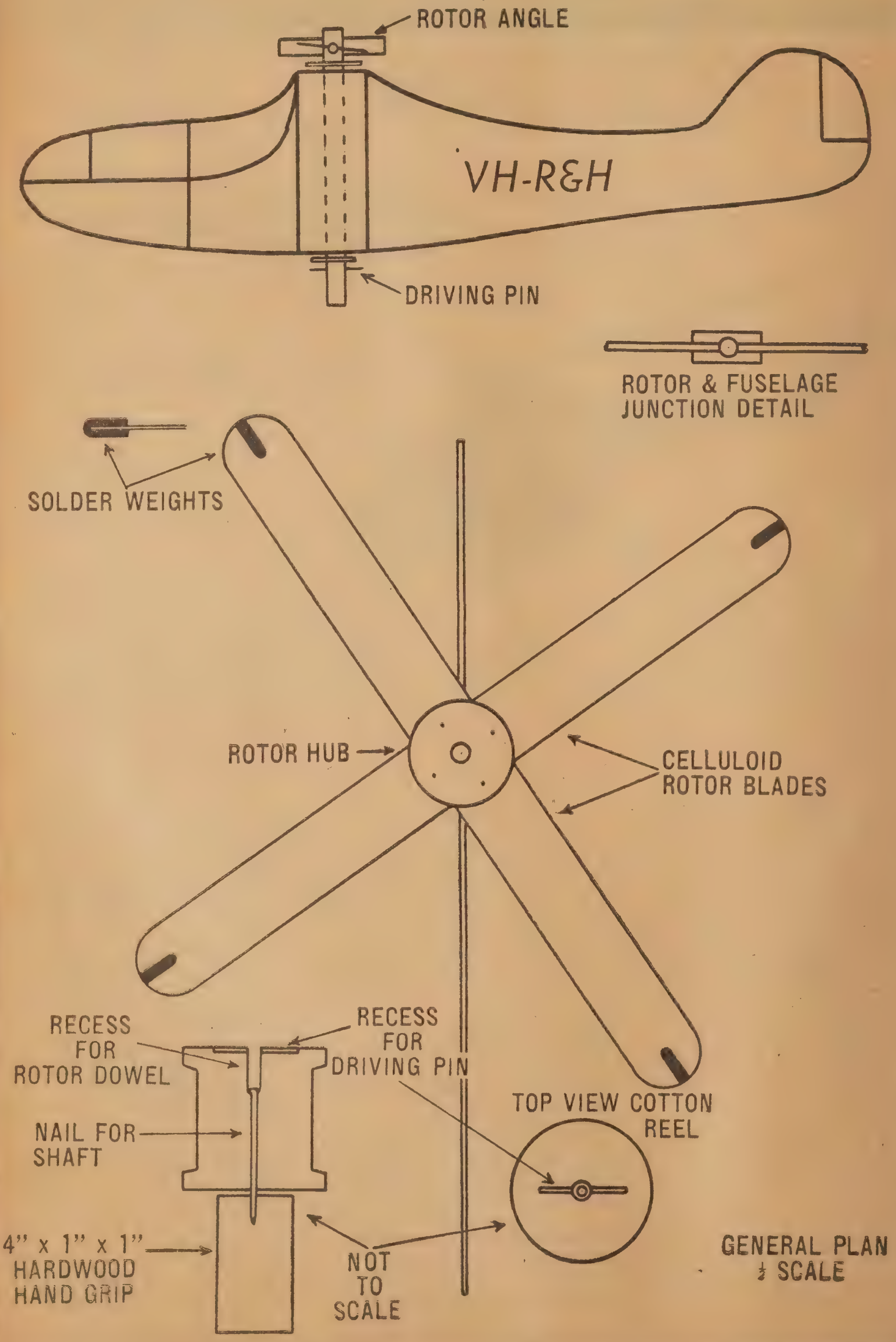
A safety feature of importance is the high kinetic energy rotor, which makes possible a safe landing in the event of engine failure.

The main blades are of wooden construction, with compressed-wood spar along the leading edge, spruce ribs and plywood covering. Sheet metal tabs are fitted near the blade tips to give aerodynamic balance.

Free-wheel gear ensures that both the main rotor and the tail rotor will auto-rotate in the event of engine failure.

Fixed tricycle-type landing gear with a 9ft wheel track is fitted. All three wheels have pneumatic shock absorbers, and there is a tail skid to prevent damage to the tail rotor.

HELICOPTOPLANE


ROTOR ANGLE
VH-R&H
DRIVING PIN
ROTOR & FUSELAGE JUNCTION DETAIL
SOLDER WEIGHTS
ROTOR HUB
CELLULOID ROTOR BLADES
RECESS FOR ROTOR DOWEL
RECESS FOR DRIVING PIN
NAIL FOR SHAFT
TOP VIEW COTTON REEL
4" x 1" x 1" HARDWOOD HAND GRIP
NOT TO SCALE

GENERAL PLAN
½ SCALE

MAKING A MODEL HELICOPTER

Something new in the way of model aircraft is presented this month and perhaps it could be classed more in the category of a toy than a serious effort at aeromodelling. For this we make no apology as it is a very interesting diversion from the more stereotyped models which we usually present.

WE can particularly recommend it as a very robust toy rather more suitable for the younger fry than the usual rubber driven model plane.

This machine which we have called the "Helicoptoplane" is strictly speaking a helicopter, that is, it is capable of ascending or descending in the vertical plane. However, due to the fact that there is usually some wind blowing, the model quite often covers a considerable amount of ground before finally landing. The distance flown is, of course, dependent on the strength of the wind, and on quiet balmy days the flight will consist of a rapid climb to thirty or forty feet with a gradual descent and little or no distance will be covered.

In a helicopter of this type the lift which causes the model to climb is generated by the four-bladed windmill type of fan which is situated on top of the model.

This fan is in effect a four-bladed propeller mounted in the horizontal rather than the vertical plane, and so when it is spun it acts similarly to any other propeller, but in a horizontal plane.

TECHNICAL DESIGN

The effect then is more upwards instead of forwards, and so we get our vertical flight.

In the design of a helicopter we have many factors of a technical nature to consider as well as securing upward motion, the main one being that the propeller or windmill must generate sufficient lift to raise the complete machine vertically.

This is not particularly difficult to do, as it is only a matter of having sufficient blade area and the correct angle on these blades. However, if we should make our windmill with rigid blades as with an ordinary propeller we will immediately run into severe difficulties with instability and our model will become hopelessly unstable and useless for flight.

This difficulty is overcome by the use of flexible blades, which automatically adjust themselves to various flight altitudes and loads. This is the reason for the use of celluloid for our rotor, or windmill as we previously called it. There are other means of securing stability in a helicopter, mainly by the use of hinges, but in a simple model such as this we find the use of celluloid rather more to our liking.

Having run through some of the design aspects of a helicopter let us now clear the bench and gather the following materials and tools:

12in x 3in x 1-8in balsa panel.
6in x 1in x ¼in balsa block.
9in x 5in x 1-32in celluloid (the thickness is not particularly important).
4in x ¼in diameter hardwood dowel rod.
Small quantity 18 to 20 gauge wire.
Four inches resin cored solder.
1½in diameter wooden wheel ¼in thick.
Two small washers with ¼in hole in middle.
One cotton-reel.
4in x 1in x 1in piece of hardwood.
One large nail with a flat head.
Some strong white cord.

You will need a razor blade, scissors, knife and some model cement.

THE FUSELAGE

The first job to do is to make the fuselage, and we use our balsa panel for this. On the panel make a pencil drawing of the fuselage side as per plan, and to help you in this we have made our drawing half-scale. That means that your drawing on the balsa panel must be just twice as big as those on our plans.

When you have completed this drawing cut around the outline, using a sharp knife or a broken razor blade. Then sand the resultant fuselage shape smooth on the edges and side with sandpaper. You could now draw in the lines indicating the glass cabin, as we have done. Quite possibly you may like to put a small transfer of a boy or girl on either side of the fuselage in such a manner as to indicate that they are flying the plane.

by Jack Finneran

Moving on to the next job we take our piece of 6in x 1in x ¼in balsa and cut it in halves. Each piece is cemented to the fuselage at the position indicated on the plan, that is, one piece on either side, as we need the bulk at this position as we have to drill a 9-32-inch hole through here later to take the dowel on which the rotor is mounted.

You must not attempt to drill this hole, however, until you are sure the cement has set, and overnight drying is a good idea.

Having disposed of the fuselage, we now tackle the most difficult part of our model, and careful work here will pay dividends in successful flights later on. First make the rotor blades, and these are cut from your celluloid strip with the scissors.

You then add the small weights at each rotor tip, as indicated on the drawings. These are made by using 1-inch lengths of solder which are placed through a hole in the rotor tip bent in the shape of a U and cemented in place.

Don't forget these weights, as the plane is useless without them. It is due to centrifugal force acting on them that we get our rotor to remain stiff enough to lift while still retaining a certain amount of flexibility which is necessary for the automatic stability we spoke of earlier.

You will find that a slight increase or decrease in these weights balanced against the thickness of the celluloid you use will help you to secure maximum performance, although this is not critical.

Having fabricated your rotor blades and attached the weights, you now have to secure them to the hub. This hub needs to be about ¼-inch thick, and quite often a small wooden wheel can be found which will serve nicely for the purpose. Failing this, however, you will have to make one.

Using your knife, razor-blade or a small saw-blade, slot the hub as indicated in the side view on the plans and try and maintain the angle indicated. You then cement the rotor blades in place in these slots and cement liberally, otherwise they may pull out.

This gives you your rotor, and you can see now that, due to the angle of the slots in the hub, each blade has a small lifting angle such as a propeller. It is this angle which governs the lift of your machine, so be very careful on this particular part of the work.

When the cement has set thoroughly, drill a hole through the middle of the hub and cement the ¼in dowel rod in place, as indicated in the drawing.

You may now assemble the plane. Here again the drawings must be your guide as to the placement of the washers and the piece of wire

(Continued on Page 85)

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Used Don. 5 Tested O.K.

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WHAT DO YOU KNOW ABOUT SAWS?

The saw was one of the first tools invented by primitive man to make his work easier. Early saws were said to be thin flakes of flint with chipped edges and could cut soft wood, flesh or bone. Later on, allegedly, vines and creepers were added to make comfortable handles. By way of variation, pieces of flint were cemented into grooved sticks.

WHEN methods of using metals were discovered (about 1000 B.C.) the efficiency of saws increased very much. It is thought that the early Egyptians used saws with jewelled teeth set in bronze. A little later on it became possible to make saws from iron and a crude type of frame saw came into use.

The greatest progress in saw design was made during the last century. The 19th century saw great development in machinery together with corresponding development of metals. As a result of this development, the modern saw cuts with comfort, speed and little waste of energy.

MANY TYPES

Because of the demands of industry, many distinct types of saws have been developed for special purposes. To understand saws properly it is necessary to classify them according to their use.

The main division is between those saws which are designed to cut straight and those which are capable of cutting curves. A further division is between saws which are designed to cut across the grain and rip saws which are most efficient when cutting with the grain.

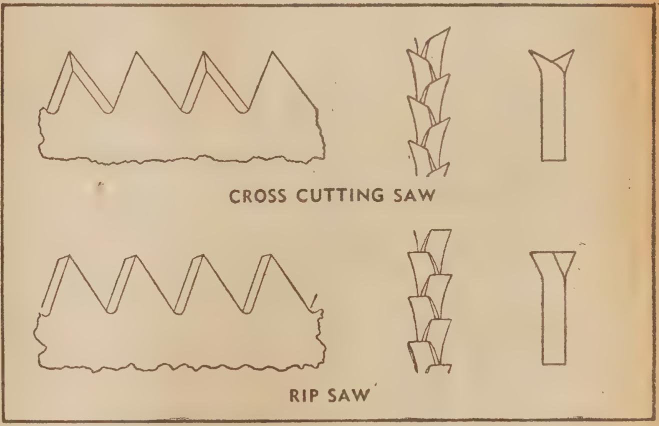
Most saws designed for cutting curves have teeth designed to cut in the direction of the grain since most of the cutting is usually in this direction. To enable them to change direction quickly, curve cutting saws have narrow blades. This, in turn, makes it difficult to get sufficient stiffness for the blade to be self supporting. Therefore, saws capable of cutting sharp curves usually have a frame between which the blade is stretched.

THRUST

A point of interest about saws in general is that the handle is usually designed so that it gives a forward and downward thrust at the same time. Saws which are used mainly for horizontal cutting, such as tenon saws, have the handle sloped at an angle of about 50 degrees with the cutting edge. Rip saws and other saws which are generally used in a vertical position or thereabouts are fitted with handles with less slope. A common figure is 75 degrees.

As you will see from the diagrams, the teeth of a rip saw are shaped like a series of chisels. Since they do not cut across the wood fibres, points are unnecessary. As each tooth comes in contact with the wood it mortices out a small piece.

The cross-cut saw is a contrast with this as its action is to sever the wood fibres. Each tooth behaves in a similar manner to a knife. All woodworking saws are designed to cut on the forward stroke and the leading edge of each tooth makes a greater angle with the direction of cut than the trailing edge. Take great care not to run woodworking saws into nails as the cutting efficiency depends on the blade having fine, sharp edges.



The largest saw usually found in the home workshop is a rip saw. It usually has a length of about 28 inches, the blade being about 8in wide at the handle and 3in wide at the end. A rip saw of this size usually has from 3 to 4 points per inch.

Sometimes, where it is desired to keep the number of tools down to a minimum, a half-rip saw is a good choice. If a full kit were available such a saw would be used for oblique cutting or cutting thin timber in the direction of the grain. However, a half-rip saw is a good compromise and will cut quite well in both directions. It is made slightly smaller and with slightly smaller teeth than the rip saw.

by Maurice Findlay

Cross-cut saws (sometimes called hand-saws) are generally made about 26 inches long, with the blade tapering from 7 to 2½ inches. The teeth are finer than the rip-saw. A common figure is from 6 to 8 points per inch. The cross-cut saw is used for cutting across the grain in all heavy timbers, for ripping in thin timber, and for all cutting in presswoods and plywoods.

The panel saw is similar to the cross-cut saw except that it is smaller. About 20 inches is a common length, with from 9 to 12 points per inch. The panel saw is useful for all general light work, and if you are setting up a home workshop with limited cash, a good quality panel saw is a good choice.

BLADES

The saws we have mentioned all have flexible blades. While a skilled carpenter can cut accurately with them, they do not leave a particularly smooth finish, and where such a finish is required it is necessary to finish with a plane or some other smoothing tool. When dealing with woodworking joints it is often not possible to use a finishing tool, and the initial cut must have sufficient accuracy and finish.

For this type of work, the tenon saw, and its smaller counterpart, the dove-tail saw, have been developed. The tenon saw has a thin, rectangular blade, with a brass or steel stiffener folded along the back to prevent buckling. A small tenon saw has a blade about 10 inches long and three inches wide, with about 16 points per inch. However, they are often up to 16 inches long and five inches wide, with about 12 points per inch. Special tenon saws for use in mitre boxes are made up to 26 inches in length.

The dovetail saw is very similar to the tenon saw, except that it is smaller. It may be provided with a handle of the same shape as the tenon saw, although they are frequently provided with a simple round handle. Dovetail saws average about eight inches in length, and have about 16 points per inch. The method of sharpening dovetail saws is especially interesting, because no special "set" is provided as with other saws. The slight burr left when filing the teeth is relied upon to give clearance for the thin blade.

BOW SAW

The largest saw used for cutting curves by hand is the bow saw. It consists of a thin blade about 3-16 inches wide and 12 inches long, held in a wooden frame. The blade is kept in tension by a "Spanish" windlass.

Both the coping and fret saw are used for very fine work, where it is necessary to cut curves. The coping saw consists of a rectangular wire frame, designed to carry a blade about six inches long. The thin narrow blade is held in slots in the frame, the frame being designed to keep the blade in the required tension. In the better quality coping saws a wooden handle is provided, but many of the cheaper types have the handle formed from wire integral with the frame.

The fret saw is similar to the coping saw, except that the frame is usually made from flat steel bent in the form of a long rectangle. This allows the blade to enter further into the work. The handle is usually made of wood, and the blades are held in place by thumb screws.

This incidentally, is the distinguishing feature between fret saw blades and coping saw blades. Both are of about the same weight and length, but only the coping saw blades have looped ends. Actually, in an emergency, it is possible to break the loops off coping saw blades and use them in a fret saw. However, it is not possible to use fret saw blades in a coping saw.

PRESSURE

With both fret and coping saws, great care should be taken not to put too much pressure on the blades as they are very fine and easily broken. It is especially necessary to be careful with fret saw blades because the frame is comparatively heavy.

Both coping and fret saws can be used to start cuts from the inside. All that is necessary is to drill a hole about 3/32in diameter. With the coping saw, the blade may be turned at right angles to the plane of the frame where this is more convenient. The blades for both saws are quite cheap and may be bought in packets of a dozen. It is not economical to resharpen them.

All the other saws we have mentioned are capable of being resharpened. This is a job which is best carried out by an expert but it is handy to have a knowledge of the

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VICTORIA

subject in case a saw has to be sharpened in an emergency.

The first operation is known as topping. It consists of drawing a file flat along the tops of the teeth to ensure that they are all of the same height. Sometimes, where the saw has been carefully looked after and the teeth are even, it is permissible to omit the topping operation.

The teeth of the saw must be "set" or alternately bent to the right and left. This gives clearance so that the rest of the blade can pass through the wood without undue friction and waste of energy. It is possible to set a saw with a hammer and punch but the operation is best carried out with a special tool which is available for the purpose. Note that only the points of the teeth are bent.

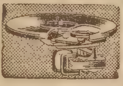
SHARPENING

The final and actual sharpening operation is done with a special three cornered file called a saw file. Tradesmen use a special vice or saw cramp for the purpose of holding the saw in place. Rip saw teeth are filed at right angles to the length of the blade while all other teeth are filed at an angle to form sharp points. Care should be taken to make each tooth even and bring it to a sharp point as the tips of the teeth only are responsible for the saw cutting easily or otherwise.

Always have good light when sharpening saws as the teeth are comparatively fine and are difficult to see, especially after some time has been spent at the job.

Two or three well-chosen saws are among the most useful items in a woodworking tool kit. If they are well looked after the time spent in doing so will be more than repaid by easy cutting and well finished jobs.

PHONOMOTORS



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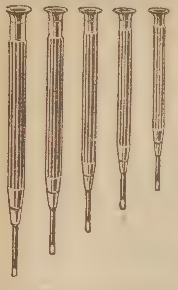

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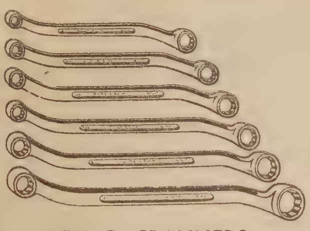

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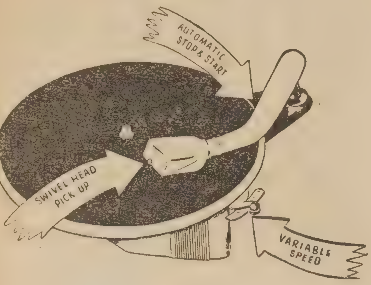

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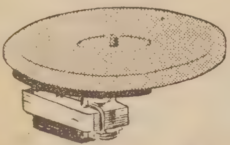

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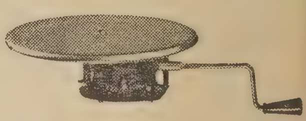

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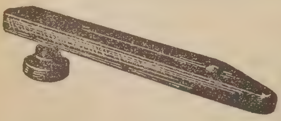

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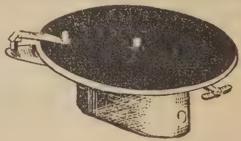

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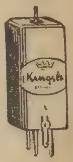

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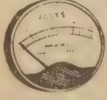

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NOVEL HELICOPTER

(Continued from Page 79)

which passes through the lower end of the dowel and acts as the driving pin for the rotor.

The motive power used to launch he "Helicoptoplane" plane into light is a relatively simple device, but it must be well made if you are o secure the best results from it.

It consists, as the drawings indicate, of a cotton reel, nail, and a base which is held in the hand. You must see that the nail is a nice running fit in the reel but not too sloppy, o that it will run smoothly when he cord is pulled.

The dowel from the rotor must it nicely into the clearance hole n the top of the reel, and the wire driving pin must fit down into the recess cut for it in the top of the eel. Work according to the plans and you should have no trouble in his direction.

To fly the machine, wind the cord around the cotton reel as you would wind a cord around your favorite spinning-top (it's a long time since I spun a top, too). Set the plane nto the reel with the wire driving pin down in its slot and then, holdng the base in your hand at arm's-ength, smartly pull on the cord.

PERFORMANCE

The machine will rise vertically from your hand and climb away in he breeze. If, however, it refuses o leave your hand, the odds are you have wound the cord on the wrong way round, and so the rotor s pushing down instead of lifting up. Check this point, as the rotor must revolve in the direction indicated in the drawing. Gradual practice will give you excellent flights, but please don't fly near wires; it s dangerous.

I wonder if I may specifically warn you control-line fans to keep well away from wires when flying your planes, as we read all too often of fatal accidents in America due to electrocution following this practice, and only the other day a Victorian lad was killed in similar circumstances.

AERIAL FOR TOURER CAR

IF you own a fabric top tourer car there is no need to mutilate the body to install a radio aerial. It is a simple matter to install the aerial under the hood out of sight.

Most tourers have a strengthening belt running from the windscreen to the rear of the car and the aerial can easily be installed between this and the hood. Make a few loops of cotton in the belt so that the wire will not slip out of place. Ordinary flexible nylex covered hook-up wire may be used. Take care not to puncture the hood. It is made with a centre layer of rubber and cotton fabric either side and may allow water to see through if ill treated.

The lead between the receiver and the top of the windscreen may be 70 ohm coaxial cable with the outer shield earthed.

THE JUNIOR EXPERIMENTER

(Continued from Page 39.)

tance, which can amount to as much at 100 pF.

In this case the grid of the 6B6-G is connected to the secondary winding of the last IF transformer, with the plate connected to the primary of the same transformer providing a further reason for oscillation.

NO AUDIO

It would be impossible for the valve to act as an audio amplifier, since both the grid resistor and the plate resistor are shunted by the windings of this transformer. The dc resistance of the windings is much too low to allow any useful audio voltage to be developed across them.

And now to the power supply circuit.

It seems that our contributor is very confused as to the functions of the various sections of the supply. The first point that we noticed was that there is no HT voltage on the plates and screen of any of the valves but that there is HT on the grid of the 6V6-GT and X6IM.

Also the 200 ohm resistor and the filter choke form a bleed resistor of approximately 500 to 700 ohms directly across the output of the rectifier. This would impose a very heavy load on the transformer and valve and the valve would probably be ruined after only a few minutes of this treatment.

Actually the 200 ohm resistor in series with a 50 ohm resistor should be connected between the transformer centre tap and earth. The grid return of the 6V6-GT should be connected to the junction of the transformer and the 200 ohm resistor and the AVC and 6B6-G cathode return should be taken to the junction of the two resistors.

CONDENSERS

One of the electrolytic condensers should be connected from the rectifier cathode to the transformer centre tap. Then the filter choke should be wired between the HT line in the set and the rectifier, with an electrolytic bypassing the output side of the choke to earth.

Well, that about covers this circuit. We would like to thank the writer for his effort and hope we have not discouraged him too much. We suggest that he study the circuit diagram of the "Corner Set with AVC," which appeared in the January, 1950, issue of Radio and Hobbies. This set is a typical example of a four-valve mantel receiver.

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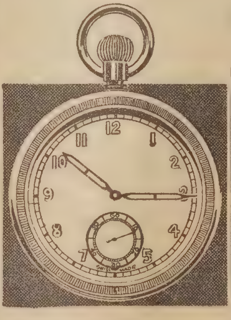

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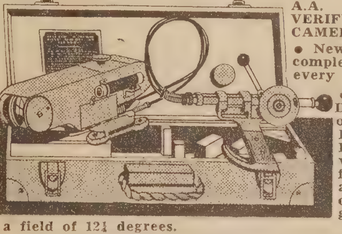

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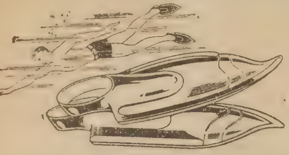

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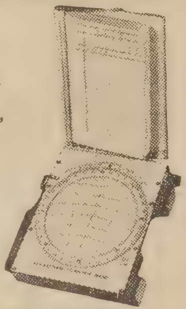

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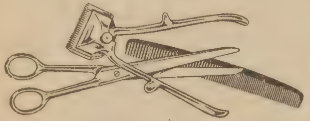

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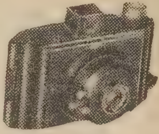

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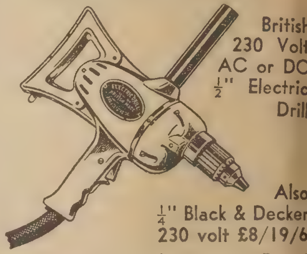

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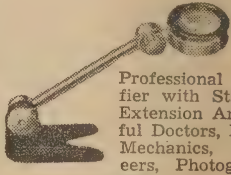

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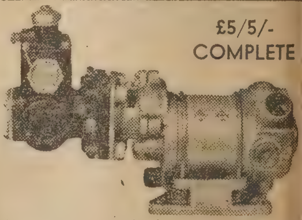

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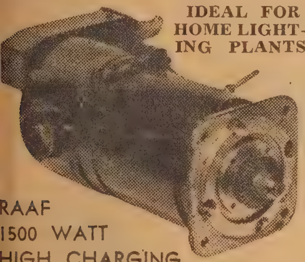

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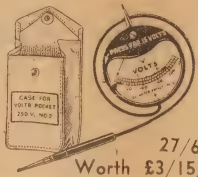
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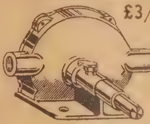

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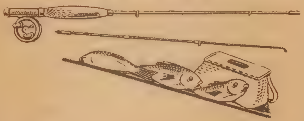

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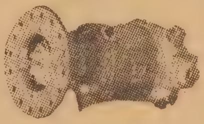

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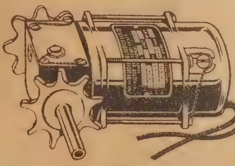

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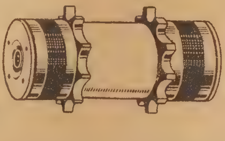

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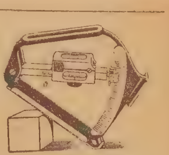

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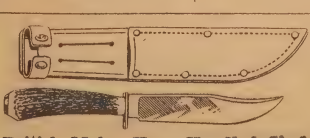

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AN INTRODUCTION TO VHF AERIALS

(Continued from Page 48)

spectively, and the spacing between them reduced to 1 inch, the ratio becomes 16-1. The critical points are therefore the ratio of the two diameters, and the spacing between them, a wide variation of step-up ratios being available for various combinations.

The examples given above, which hold for any frequency, will be found probably the most useful. For a folded dipole, the separation distance is not critical, and 1½ or 2 inches will be satisfactory.

Leaving parasitic elements, and considering half-waves fed from a common line, we find a number of combinations possible for obtaining directional effects. Quite often a number of "driven" elements are used, each provided with one or more parasitic elements to give further gain.

TWO DIPOLES

The simplest combination of driven dipoles is the well-known, "two half-waves in phase." Two dipoles are supported in line, and joined by a folded half-wave to form a quarter-wave section, at the centre of which will be found approximately 72 ohms. A 72 ohm twin-lead or cable may be used to feed it at this point with a good match, as in Fig 2C. This aerial gives a gain of about 3 db over a plain dipole, and is quite easy to construct even at 14 mc.

As is quite obvious, the combinations of driven elements and parasitic elements into beams is almost infinite, and the complications of feed for each are somewhat outside the scope of an elementary article. One or two tried designs may be mentioned however, giving the essential dimensions from which successful beams can be made. In all cases it is essential that such beams be mounted clear of surrounding objects for at least one ½-wave length at the frequency concerned, as the radiation "pattern" and the feed point impedance are likely to be seriously affected by proximity to such objects.

16-ELEMENT BEAM

At Fig. 3 is shown a 16 element beam which is easy to construct, and which has a broadside gain of about 13 db. representing a multiplication of signal equal to about 20 times. It has eight half-wave elements connected at the ends, backed by an equal number of ¼-wave spaced reflectors. Inspection will reveal that the driven elements are end-fed at high impedance points, which are in parallel as seen by the feed-line. This reduces the impedance at the feed point to about 300 ohms., assuming the dimensions given are followed.

Should a feed line of 72 ohms be required, it would be possible to transform this 300 ohms down to 72 by using a piece of 150 ohm ribbon of a ¼-wavelength shortened by 20 per cent.

This beam is easy to make because no insulation troubles exist at the centres of the dipoles. At the feed-point, a couple of good insulators can be attached to the support, as at 300 ohms insulation is quite important. Physically it is not too unwieldy even at 50 mc. At 288 mc, it is quite small. Some rotating device is essential, as the beam width is quite sharp.

"3 OVER 3"

Another popular type of beam illustrated here is a double three-element type known as the "3 over 3" for obvious reasons. Its main advantages are extra gain over a single beam—about 4 db—and a much lower vertical angle of radiation, very valuable at the high frequencies.

Ideally the two sections should be spaced a half-wave length apart, and, if connected by an open wire line of 300 ohms, could be in fact. The convenience of the 300 ohm ribbon is the reason we have shown the spacing as being .83 of this distance, as this figure represents the propagation constant of the line. Without going into calculations, it will be found that the feeding of the array by 300 ohm ribbon or line achieves very nearly a perfect match for the array. From the information given here, it is fairly easy to work it out for yourself, although of course, it is not the only way in which such a beam could be fed.

A couple of points by the way about folded dipoles, used in several of the examples given here. The junction of the two dipoles at each end may be rounded—possibly the easiest mechanical method as it entails no break—or they could be joined together with a small strip to give a square end. In either case, half the length of the joining portion must be added to the length of each dipole when calculating the length of the radiator.

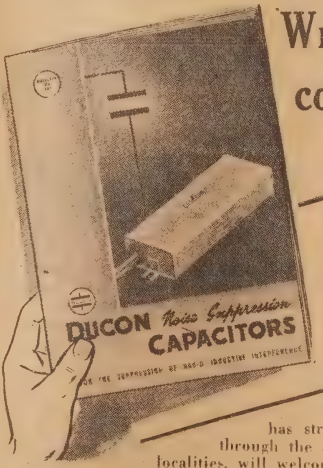
AT RIGHT ANGLES

This is important, as with short elements and say a two inch spacing, failure to do so would make each element about 2 inches longer than it should be. The array would still work, but it would not be correctly tuned. The exact spacing of the dipoles isn't very critical.

The second point is that the folded section should be at right angles to the plane of the array, and not lie parallel with it. As both dipoles radiate—it is this division of current which gives the step-up effect—failure to do this will of course upset the spacing. This isn't as important as getting the right length, however, for the actual spacing between the elements isn't at all critical.

You can easily demonstrate this

(Continued on Page 103)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SHORT WAVE NOTES BY RAY SIMPSON

CIVIL AVIATION RADIO IN PARIS

NEW SOUTH AFRICAN SERVICE

One of the most interesting new stations heard for some time is the Civil Aviation Tele-communications and Signals transmissions from Paris which were heard nightly at quite good strength on a frequency of 20.09 mc. These transmissions have been heard from as early as 5.30 pm and were still on the air after 11.0 pm when strength was even better.

THE programmes consisted of a re-broadcast of one of the regular Paris broadcast band stations, and then, on the hour and half-hour, the Civil Aviation announcer would take over and give the station identification, first in French and then in English, as follows:—

"You are listening to an experimental transmission from the chief broadcast station of the Civil Aviation Telecommunications and Signals, in Paris. We are actually carrying out tests and adjustments. We would appreciate detailed reports of reception from listeners, giving the precise hour of reception and details of the receiver in use. Please send your reports to The Manager, Civil Aviation Telecommunications and Signals, 155 Rue de la Proix Nivert, Paris 15 1 will spell the words in French, first word Rue, R-u-e, second word De, D-e, &c." The entire announcement was then repeated in Spanish, then in German, and finally in a language we were not able to recognise.

We notice in the latest issue of Sweden Calling DX-ers that European listeners report hearing this station on another frequency, namely 6.033 mc., from around 12.15 am, but we have had no reports on this channel from any Australian listeners, and think it very doubtful if anyone out here could hear it, as this portion of the 49 metre band is very crowded, plus the fact that European stations are not normally heard on this band at that time.

We are now looking forward to receiving our verification from this interesting station, as they may give some reason for carrying out their tests, which, judging by the multi-lingual announcements, they expected to be heard at least throughout Europe. Incidentally, the station is not now being heard, unless it is on a new frequency.

SPRINGBOK RADIO

The South African Broadcasting Corporation's short-wave services have up to the present been exclusively engaged in the rebroadcasting of the normal English and Afrikaans programmes from Johannesburg, Capetown and Pietermaritzburg. Their programmes are along the lines of those from the ABC in Australia, and do not carry any advertising matter.

It would seem that South African listeners have not been too happy with the type of programmes being provided by the SABC, and have been listening to the Lourenco Marques station, which provides a much more entertaining type of programme. This situation has evidently been a matter of concern to the SABC, as they have now announced that a new service, to be known as "Springbok Radio," will come into effect as from May 1, 1950. This new service will broadcast commercial programmes from the Transvaal and from other provinces at a later date, and will use frequencies in the 31, 40, 60, 90 and 120 metre bands. Specific frequencies are as yet unknown, but we hope to have them in time for our next issue.

We are indebted to Graham Hutchins' DX Session, from Radio Australia, for the above information, and we know that all Australian listeners will be on the lookout for "Springbok Radio," as up to the present South African short-wave transmitters have not been heard very well in this country.

BRITISH AND AMERICAN MAGAZINES

READERS who would like regular information regarding forthcoming short-wave programmes and full schedules of transmissions from either the BBC or the Voice of America should write to addresses given below

LONDON CALLING

Published weekly, this journal contains full information about programmes, wavelengths and coverage of the General Overseas Service in English and other languages. Each edition gives the programmes for a full week and an outline of outstanding programmes to come. In addition to programme information, London Calling publishes many interesting articles of lasting interest on life and events in Britain and abroad.

It is despatched from London 30 days ahead of the programmes it announces A sample copy and details of subscription rates will be supplied on application to the Director of the Overseas Services of the BBC, Broadcasting House, London, W1, England.

THE VOICE OF AMERICA

The Voice of America organisation in the USA publishes a very well-produced schedule of their World Programme Schedules, and this magazine is sent free to all listeners who care to write for a copy. It is usually published about six times a year, and in addition to many interesting articles on various phases of broadcasting, all illustrated with very fine photographs, a complete schedule of their broadcasts is given.

SHORT WAVE notes for the April issue are due on March 11. For the May issue they are due on May 8. Please send them direct to Mr. Ray Simpson, 80 Wilga Street, Concord West, NSW.

These schedules include the programmes in English, Bulgarian, Czech and Slovak, French, German, Greek, Hungarian, Italian, Persian, Rumanian, Russian, Spanish, Yugoslav, Portuguese, Chinese and Korean. In the English section, details are given of all the main regular features, such as Press Opinion—USA, Make-Believe Ballroom, Howard Barlow Orchestra, &c. Times on the air, call letters and frequency are shown for all transmissions. This schedule magazine can be obtained regularly by sending your name to The Voice of America, New York 19, NY, USA, advising them that you would like to obtain the English edition of their programme schedule.

Flashes From Everywhere

SAO THOME: In last month's issue we gave details of the new short wave stations in this Portuguese possession, and gave them as CR5SA on 11.785 mc, and CR5ST on 9.615 mc. From Radio Australia we have now received additional information which gives rather different information. It now appears that they operate as follows:—CR5SA on 9.615 mc from 4.0 am to 6.0 am, and CR5SB on 17.677 mc from 1.0 am to 3.0 pm. The programmes are beamed to Portugal, and the station is anxious to receive reports. We have tried for them over CR5SA on 9.615 mc from just after 4.0 am, but could not hear a whisper of the station.

PHILIPPINES: In the February issue we advised listeners that the new Philippine station, DYB2 on 4.98 mc, was known as "Radio Davao" in Mindanao, as this is the identification we had received from Art Cushen. For once, Art seems to have been wrong with this one, as we have just received a letter from the secretary of the Radio Control Division in Manila advising us that DYB2 is owned and operated by Mr. Mario Lizares, of Bacolod City, Negros Occidental, and transmits on 4.985 mc short wave and on 1120 kc broadcast band with call of DYBR. He also advises that both these stations are at present testing and operating under a construction permit, and that the proposed power of DYB2 will be 250 watts.

ARGENTINA: Word has been received from the Servicio Radiofonico Internacional in Buenos Aires that they will commence a regular broadcast in both German and Swedish. Initial tests will be made over LRU on 15.29 mc from 15th to 28th February, prior to commencing a regular service on 1st March.

Letters and reports from listeners will be answered over the air from LRU. Incidentally the S.R.I. programmes are still being heard over LRY on 9.455 mc, until closing at 4.0 pm, but strength of signal is not nearly as good as it was a few months ago. These latter programmes are all in English, which makes it easy for those who do not have much success with Spanish. Both lady and gent announcers are used at LRY.

NORTHERN RHODESIA: From "Sweden Calling DX ers," we learn that the Northern Rhodesia station ZQP was to begin transmitting on a new 15 kw transmitter at the end of last December, and that another 15 kw was to go into operation in Southern Rhodesia at the same time.

Although the station did not make any comments as to what frequencies would be used, they did say that longer and more frequent English transmissions would be made. At the present time ZQP is using 3.915 mc and 7.22 mc from 3.0 am till 5.30 am. with three English programmes each week. No mention was made of their 9.71 mc channel, but the last time we were listening in the early hours of the morning, they were still operating on this outlet.

SPANISH GUINEA: From the latest issue of "Radio News and Television, we learn that the long awaited station, "Radio Atlantico" will not be operating on their proposed 200 kw station until later this year. However one of the Station Directors has advised that a small transmitter will be used some time early this year. Ultimately this low-powered transmitter will be used for beamed communications with the station headquarters in Madrid for necessary programme deviations and such like. A great deal of information has been published in overseas magazines concerning this station, but despite all this, the station has still not taken the air. When it does commence operations, it should be easily heard all over the world.

NEW STATIONS OF THE AIR

INDONESIA: The Indonesian authorities are making good use of their new 100 kw station, and are now also using it in the 25 metre band, under the call sign of YDF2 on 11.785 mc, where it can be logged at excellent strength with a programme in French from 3.0 am to 4.0 am, followed by a Dutch programme till the station closes at 5.0 am. When first used in this band they were operating on 11.795 mc, with the call letters YDF3, but now seem to have changed to 11.785 mc as being a better channel.

The quality of the musical numbers is really superb, and signal strength equal to a local transmitter. It is well worth getting up early to hear this one.

MALTA: The Forces Broadcasting Service in Malta still experimenting with different frequencies, and quite recently we have heard them using 11.895 mc from around 4.0 pm till after 5.30 pm, when strength was exceptionally good and much better than on any of their other outlets.

The entire programme was a rebroadcast of the BBC, but each half hour and sometimes more often they announce as "This is your Forces Broadcasting Station, Middle East." They have also been heard on 4.965 mc around 5.0 am to 6.0 and ask for reports from listeners to this channel to send their letters to the FBS at Malta Garrison. They send out a very attractive folded verification card.

PAKISTAN: Here is another country which appears to be having a great deal of difficulty in finding a suitable outlet as they have now been heard transmitting on 11.81 mc in parallel with 11.77 mc, with the news in English at 10.0 pm. The transmission is spoilt, however, by our Australian station VLC7, which also uses 11.81 mc at that time.

At 12,15 am, Pakistan can again be heard coming on the air on 9.645 mc, when they open with a news session in one of their native tongues, possibly Urdu or something like that. By careful listening, however, sufficient items can be copied to enable a report to be compiled as all proper names seem to be given in English. Strength in the 31 metre band is not quite as good as when they are on 11.77 mc.

Since writing the first part of this paragraph in which we said that Pakistan was operating on 11.77 mc and 11.81 mc, another change has been made. Karachi can now be heard with the news in English at 10.0 pm, on an entirely new frequency, just outside the 25 metre band, namely 11.545 mc. The same programme can be heard on another new frequency of 11.845 mc, which is of course in the 25 metre band proper.

The 11.545 mc outlet is much the best as it is in the clear, and comes in at great strength, while the 11.845 mc suffers from interference from nearby stations. Possibly by the time these notes are in print, Pakistan may have made another change, so keep a lookout for them on other channels.

MAURITIUS: This small British owned island off the east coast of Africa, has now been heard operating on 15.06 mc instead of their former frequency of 7.3 mc. They come on the air at 12.45 am with a march and then announce in French "Ici Ile Maurice." On the morning we heard them, they were broadcasting a recording of New Year Greetings from various residents on the island. Most of them were in French, but there were a few English, which made excellent copy for a report. Later in the programme, they played quite a number of Victor Sylvester recordings, most of which are well known to listeners. We understand that the call letters of this station are V3USE.

VIETNAM: We hardly know whether to call this country Vietnam or Indo-China, as its political standing seems to be in some doubt, depending on one's own viewpoint. Notwithstanding this however, we do have a new short wave station which can be heard nightly on 9.67 mc, with the news in English at 9.15 pm. They announce as "This is the Voice of Vietnam in the 31, 41, and 358 metre bands." Strength is quite good and overrides the American station on the same channel. The 41 metre outlet seems to be the station which was known as Radio Hue, and which has been using 7.205 mc for some considerable time. It is doubtful as to where one should send a report, as maybe the Saigon people will not forward mail to Vietnam territory.

MISCELLANEOUS: This month we also have two new Australian stations to chronicle, the first being VLA6 on 15.22 mc, which can be heard from 7.43 am, and the second one VLC9 on 17.8 mc, which can be logged in the early morning until closing at 7.55 am.

The Haiti station 4VRW, which we noted recently as having moved from 10.135 mc to 9.795 mc, has now made a further change, and is now operating on 10.2 mc, and still being heard well at 10.0 pm.

The Taiwan station, "The Voice of Free China" seems to have left 11.8 mc, and has been reported by Dorothy Sanderson as being heard on 7.26 mc though interference is very bad on this channel, mostly from the Japanese on 7.258 mc.

NEW STATION LOGGINGS

Call	KC	Metres	Location	Time heard
Berlin	6115	49.06	Berlin, Germany	7.00 am
Radio Nigeria	7255	41.36	Lagos, Nigeria	7.30 am
APK	9645	31.10	Karachi, Pakistan	12.15 am
Vietnam	9670	31.02	Vietnam, Indo-China	9.15 pm
4VRW	10200	29.41	Port-au-Prince, Haiti	10.00 pm
APK	11545	25.99	Karachi, Pakistan	10.30 pm
YDF2	11785	25.46	Djakarta, Indonesia	4.30 am
APK	11810	25.40	Karachi, Pakistan	10.00 pm
APK	11845	25.32	Karachi, Pakistan	10.00 pm
FBS	11895	25.22	Malta	5.00 pm
V3USE	15060	19.92	Forest Side, Mauritius	1.00 pm
CS2MQ	15145	19.81	Lisbon, Portugal	10.30 pm
VLA6	15220	19.71	Shepparton, Vic.	7.45 am
VLC9	17800	16.85	Shepparton, Vic.	7.00 am
Paris	20090	14.93	Paris, France	11.00 pm

NEWS ABOUT VERIFICATIONS

Verifications have been very few this past month, and this seems to have been the case with other listeners as well. Practically nothing of real importance has come to hand so far as the writer is concerned, as most of those received were from the United States and Australian stations.

The only others were as follows:—

FBS, MOMBASA: The Station Commander of No. 2 Forces Broadcasting Station sent along a letter confirming reception of Mombasa on both 7.175 mc and 7.22 mc. He stated that these short-wave transmissions were only of a test nature, and have now been discontinued. The station has now been moved to Mackinnon Road, about 60 miles west of Mombasa, and is operating on 1420 kc. The transmitter in use, both now and at the time of the short-wave tests, was a BC610, with a power of 250 watts. The address of the station is given as No. 2 Forces Broadcasting Station, PO Box 116, Mackinnon Road, Kenya Colony.

YDF, INDONESIA: The head of the Technical Department of Radio Indonesia, Mr. M. P. Breedveld, sent a very nice letter, confirming reception of YDF on 6.045 mc. He gave the following details of their transmissions: YDF gives the Indonesian programme from 7 pm to 8 pm, and at 1 am an English programme takes the air and lasts until 2 am. This new 100 kw. transmitter is being used on 11.785 mc. as YDF2, or alternatively on 11.795 mc. as YDF3, from 2.15 am to 3 am in Arabic, 3 am to 4 am in French, and 4 am to 5 am in Dutch. The English period for Australia and New Zealand is still on YDC 15.15 mc. from 9 pm to 10 pm. In a few weeks a new antenna array will be used for YDC, and reception should then be improved on this station. At the same time, YDD2, on 4.865 mc, will increase power from 300 watts to 3.0 kw., and later on to 25 kw. This transmitter will become the principle one for the Dutch programme. The "PL" transmitters PLB4, PLB9, PLD6 and PLF2) and YDD3 on 6.17 mc., are now closed down.

ZEAH SOUTHERN RHODESIA: The Chief Engineer of the Posts and Telegraphs Department at Salisbury, Southern Rhodesia, sent a letter of verification confirming reception of Zeah on 7.29 mc. He also stated that high frequency transmissions are as yet not on a permanent basis. However, as soon as tests are completed, transmissions are to take place on either 3.32 mc. or 4.89 mc. at night, local time, and on 6.12 mc. or 7.29 mc. in the daytime, local time. The transmitter is a STC CM5, with power of 15 kw, twin channel, tropical frequency broadcast transmitter, using omni-directional antennas Call letters for 3.32 mc. is ZEAF, and for 4.89 mc. ZEAH. These transmissions are primarily intended for local reception, though all these outlets can be heard in Eastern Australia when propagation conditions are suitable.

READERS' VERIFICATION TOTAL

AT the time of preparing these notes, we have only had entries from two readers, giving their countries verified totals. We had hoped to have heard from Rex Gillett and Ern Moore, as we know that they both have very good totals. As we said in the January issue we want to hear from all our readers, no matter how many verifications they may have, and we will publish all totals of more than 50 countries verified. Here are those for Miss Dorothy Sanderson and Art Cushen of NZ.

Name	Countries verified	Total verifications
Art Cushen	118	1089
Dorothy Sanderson	62	125

It is of interest to note that Art Cushen actually has many more verifications than those listed above, but his others are for the broadcast band. Taking these latter into account, his total verifications are around 1800, from 128 different countries, which readers must admit is a very imposing collection, and we doubt if it is equalled by any other listeners in either New Zealand or Australia.

We look forward to receiving some more totals from other listeners, as it will be interesting to see how others compare with the two published in this issue.

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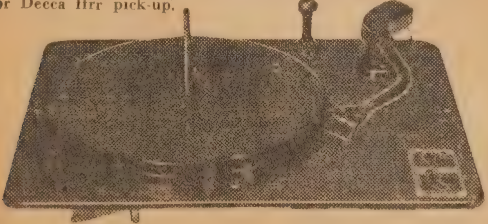

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THE HAM BANDS WITH BILL MOORE

This year we celebrate the 25th anniversary of the founding of the I.A.R.U.—The International Amateur Radio Union, the ultimate in amateur radio bodies. The Inaugural meeting was held in Paris in 1925 and the French National Society the R.E.F. during February ran an international DX contest to commemorate the formation.

REPRESENTATIVES from 25 nations attended the first meeting and formed the present Union; which has proved invaluable through the years. It has carried out the aims and purposes for which it was created—the promotion and co-ordination of two-way contacts between radio amateurs, the effecting of co-operative agreements between national societies on amateur affairs, and finally, to provide amateur radio with representation for International Tele-communication Conferences.

The original organisation allowed for individual membership, but the structure of the union was soon changed and it became one of the National Societies. The 25 original countries represented have seen the list grow to nearly 50 nations by the end of 1949.

The late H. P. Maxim, ARRL president, was elected first president; Mr. G. Marcuse G2NM vice-president, and the late K. B. Warner WIEH secretary-treasurer. Since the change of structure, the ARRL has been the headquarters society and QST the official organ.

The officials of the HQ society automatically become the office bearers of the Union.

The average amateur sees little of the working of the Union mainly because most of the working is at international level. At regular intervals the HQ society forwards to the member societies a calendar containing general information, and motions to be voted upon. The Federal Executive of the WIA in our case deals with the business side of the calendar and when any motion is being decided, the decision of the majority of national societies is binding. The HQ society the ARRL has performed its function extremely well since the inauguration, and undoubtedly assisted most of all in the running of the Union.

The last calendar, for instance, reported at length on the proceedings of the Inter-American Radio Conference held at Washington, outlined the Voice of America's broadcasts on amateur radio, reported on the activity of the Spanish National Society and listed national societies from the following countries who were inquiring about membership of the Union, India, Dominica, Ecuador, Haiti, Syria and Israel.

Representation at international conferences is generally undertaken by the HQ society but at Alanttic City the president, S. K. Lewer, GGLJ, and secretary John Clarricoats, GGCL, of the Radio Society of Great Britain, represented the Union. At times the WIA has been called upon to assist financially in the sending of representatives to conferences. The Union has proved valuable to amateur radio in the past and affords a means of obtaining a cross-section of worldwide amateur opinion. When you support the WIA you also directly assist the IARU in its work on an international level.

THE UHF'S

VK5JD, of Alice Springs, arrived on 50mc to become the savior for the URF gang. By now he has produced scores of WAS (Worked All States) enough anyway, to keep the Federal Executive busy writing them for some time. His activity stimulated the population on 50mc to increased efforts.

Back in November, 1948, VK5RT, by contacting VK6WG was credited with the first WAS on 50mc. However, when the official Federal WIA rules for WAS were produced the Northern Territory was included as a separate State.

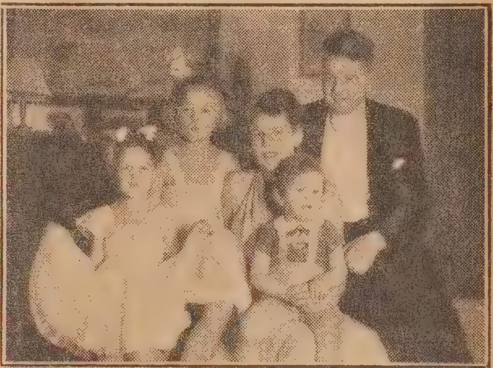
Since that time the Territory has proved a problem to the gang. It was only fitting that in early January VK5RT should again establish claim to the first WAS certificate, it should be really true this time! VK3BD on January 17 made the first contact from Victoria and VK2ABC the first from NSW, all contacts, of course, being with VK5JD.

Openings during the month were numerous and the population of the band is so thick that not one day went by without an opening occurring somewhere in Australia. During one VK2/VK3 break through VK2LY and a Victorian station changed frequency to 54mc/s and signals were S9 both ways. It looks as if quite a number of stations will be moving away from the 50mc end of the band in an endeavor to dodge the ever-increasing QRM.

★

A family shot of Johan Rosenlund, LA36, of Bergen, Norway, who is a keen seeker for UK contacts on 14mc. A ham for 20 years, he has done much in the past as office bearer in the NRRL. He has 150 watt permit, the usual power in Norway being 50 watts.

★



VK2ANU of Musweilbrook, with only 4 watts input, has been covering the 120-mile path to Sydney quite successfully. VK2AMV and 2WH, as mentioned elsewhere during the NFD, crossed the Blue Mountains with 50mc signals for the first time over the 120-mile path, a solid mass of mountains rise to 3500 feet on the way.

With the 50mc band now just another DX band, a general migration to higher frequencies is taking.

The Gladesville and Wollongong radio clubs are co-operating in an experiment to put 576mc signals between Mt. Keira (near Wollongong) to Kurrajong, in the Blue Mountains. VK2YR, VK2ADW and VK20X are all active on 576mc/s, using superhet receivers and contacts have been made up to 10 miles.

In Victoria the present record on 576 mc/s is over 90 miles, and was made between VK3ANW on Mt. Donna Buang and VK3AKE in Geelong.

Since GGUH received signals from FA8 in Algeria he has been working on schedule with ZSGGX on 144mc/s, using a special type of antenna, details of which have not been released. It was with this antenna that he received signals from Algeria on 144mc/s.

The distance to ZS is many thousands of miles and as there is no evidence of reflections from the ionosphere at this frequency the scheme sounds rather ambitious. The distance record of 860 miles is held by W4JFV and WOEMS.

In late January VK1RD on Macquarie Islands was operating on 50mc/s with a beam turned towards Australia, to date no reports of his signals are to hand.

DX AND PERSONAL

CONGRATULATIONS must be extended to Allan Fairhall, VK2KB, who was successful in the last Federal elections. He is now the Liberal MHR for Paterson (NSW). Allan is an oldtimer in amateur radio, and has been operating for over 20 years.

With 14mc conditions so poor a number of DX men are now on 7mc and some rarer stations are audible in the mornings. ZD9AA 7015 kc/s, 0500-066 hrs. E.A.S.T., is one of the best, while MD7RE, FF8GP, HZICK are all at good strength on the low end at the same time. 80 metres is still satisfactory for CW contacts to Europe in the morning and America at night. The static level is high at times but conditions should remain something the same until about the end of April.

Pirates on the 7mc band have created a little diversion of late, and one VK2MAD even reached the stage of making a nuisance of himself. After an official WIA broadcast was finished he came up and called another pirate. Some of the gang have taken cuts of the voice, incidentally, not one easily forgotten. The records are being kept for future reference.

While on the subject of pirates, XKIF and VS5KAE have been keeping the G's busy around 2100 hrs. E.A.S.T. As neither of these stations were audible here at that time they are possibly located in Arkansas—that is where the W's believe some of the rarer DX comes from.

George Cameron, VK2GC, late secretary of the WIA, NSW division, leaves soon for South Australia before doing so will join the ranks of the benedicts. If the YF permits perhaps the South Australian division can rope in a worker. Luck on both ventures, George!

Newfoundland and Labrador again are counted as countries in the WIA's DXCC, providing contacts were made with both prior to March 31, 1949. This brings the list back into line with the ARRL award.

Under the terms of an article of the Radio Regulations of Atlantic City a number of member nations of the International Telecommunications Union have forbidden radio-communication between their amateur stations and amateur stations of other countries. The following administrations have applied the restrictions—Austria, Burma, French Settlements in Oceania, Greece, Indo-China, Indonesia, Iran, Israel, Lebanon, Madagascar, Mauritius, Netherland Antilles, Siam, S. Pierre and Miquelon, Togoland.

The ARRL and IARU have taken the matter up with the Department of State in USA, and later American amateurs were told they may resume communication with the above countries pending further clarification of the matter at the international level.

CONTESTS

IT is remarkable considering Australia's suitable climate that the least supported contest is the National Field Day. In the UK and US amateurs flock forth in droves to support their NFD under adverse climatic conditions. Perhaps we have so much sunshine that the urge to venture forth in the fields with varied assortments of equipment is not present.

We must make the NFD a fashionable affair before next January, perhaps it should be the responsibility of each State WIA Council to place at least one station on the air, or possibly a special award for radio clubs would induce the various clubs throughout the Commonwealth to enter teams to participate.

The only serious competitor in NSW appeared to be VK2AMV/2WH, who operated from Mount Panorama outside Bathurst. Equipment was used on the 50, 28, 14 and 7 mc bands. Antennae on the lower frequency bands were folded dipoles, while a three element beam was used on 50mc. On the later band three VK5's were contacted. Input on the various bands was from 12 to 18 watts and a total of 4 continents helped the score along.

Of interest was the fact that signals were exchanged on 50mc with VK2WJ in Sydney the first time the mountains have been bridged.

(In 1936 Maurice Lusby heard VK250 on 60mc from Hassen's Wells at Lithgow. —Ed.)

Two lessons were learnt, firstly, never take any hay-wire on field days but take plenty of lights. The combination of hay-wire and not much light is a big handicap.

The 1950 BERU has come and gone, and the addition of the telephony section created a lot of interest, especially among the colonial stations. The contest this year was moved forward to January to hold the test under better conditions, this, however, did not prove the case here in Australia. Another problem that arose was by changing the dates the contest clashed with South African DX contest and incidentally, the Australian National Field Day.

The sooner the IARU takes control of international DX contests the better. They should control the number run and secondly, fix the time each year that contests are to be held. At least for the moment national societies who intend changing their recognised dates for contest periods should give at least six months notice to other national societies. Last year's winner, Gordon Cole, VK2DI, was a serious competitor and should score well.

EMERGENCY NETWORKS

THREE Hunter Valley amateurs, Vic Holmes, VK2AKP, of East Maitland, John Traill, VK2XQ, of West Maitland, and Harold Whyte, VK2AHA, of Newcastle, received certificates of appreciation from the NSW Police Department. The certificates were for service rendered to police during the Maitland floods last year, and they will be presented to the amateurs concerned at the next meeting of the Hunter branch of the W
These stations handled much police traf
when no other form of communicati
was available.

In a covering letter the Commissio
of Police for NSW, Mr. J. F. Scott, e
tended to all other amateur stations w
assisted the thanks of the police autho
ties for their public spirited action.

The WIA's emergency net of portal
stations in the Hunter Valley is bei
rapidly organised. It is anticipated th
approximately 20 amateurs will opera
in the net and that number will inclu
VK2AL, 2TY, 2AKP, 2KF, 2YO, 2K
2XQ, 2ADX, 2DG, 2ZC, 2AHA, 2ADT, 2V
2ANL, 2YL, 2ANU. Emergency offic
for the area, John Traill, VK2XQ, will
pleased to hear from other interest
amateurs.

WIA NEWS

THE Victorian Division's accurate f
quency transmissions are schedul
to take place on April 27, July 27 a
October 26. A number of changes ha
been arranged in 1950. They will n
commence at 2115 hours E.A.S.T. a
be given at 20kc intervals from 7000 kc
At 2105 hrs. VK3WI will open up on 7
kc/s on telephony and give general inf
mation on the transmission. These te
are run on CW at 12 w.p.m.

The PMG's frequency measuring stati
will monitor all transmissions and gi
corrections. If these corrections are ava
able immediately they will be broadc
over VK3WI on telephony on 7196 kc
if not during the following Sunday broa
cast.

Rules covering the recording and
transmission of amateur stations are pu
lished in Amateur Radio for Februa
Permits are granted to stations who ha
recording equipment of good quality, p
experience in recording. Permits ha
been issued in most States, a restrict
number only are available and the facil
is not available to all amateurs.

Much publicity is being given in E
lish radio journals to the gift parc
being sent to English amateurs from th
Australian counterparts. The gestu
judging from remarks published is mu
appreciated.

A number of changes have taken pla
in WIA in NSW. George Cameron, VK2C
as mentioned elsewhere, has resign
from the position of divisional secreta
and in his stead Maurice Butler, VK2AA
has been elected. It is only with the h
of members generally that the secretar
position is tenable, so please assist hi
fellows.

Vice-president Clive Hutchison, VK2Y
also resigned owing to pressure of wo
Clive has been a councillor for ma
years and since the war has been dispos
officer for the division. Most of the ga
appreciate his efforts along that li
Vaughan Wilson, VK2VW, is the new vi
president. Vaughan, incidentally, is n
responsible for VK2WI transmissions a
can be heard each Sunday morning.

Another secretary to retire is B
Pearce, VK2CW, of the Hunter bran
also due to pressure of work. The mort
ity rate among secretaries is fairly hi
the reason being not only do they do
lot of work but collect many of t
"kicks" as well. Bill worked extrem
hard to see the branch formed and co
tinued in the position of secretary af
the initial meeting. The gang are so
to lose you and wish you best, Bill!

The Federal Executive of the WIA
ceived word from the PMG's Departm
that future AOCP examinations wo
include questions on Narrow Band F
quency Modulation (NBFM), and Sin
Sideband Suppressed Carrier (SSS
transmissions. The standard will
elementary to the ARRL Handbook.

Intending amateurs in England ha
only one opportunity each year to
tain their licence, not the four opp
tunities the PMG's Department offers
here.

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during the 1949 RSGB National Field D
and although the power was limited
5 watts input, one station managed
contact five continents.

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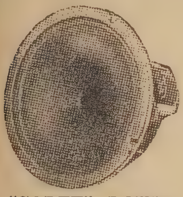

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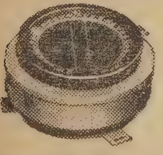

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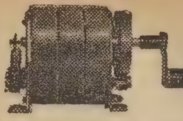

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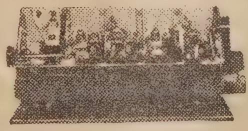

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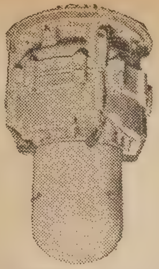

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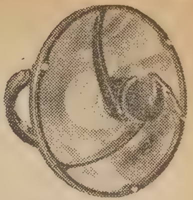

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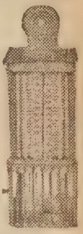

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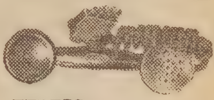

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OFF THE RECORD — NEWS & REVIEWS

One difficulty I find in writing these notes on gramaphones is to interpret technical matters in non-technical language, and make the result mean something. It's not by any means an easy job. Particularly when questions are asked which demand a certain special knowledge before cause and effect can be appreciated.

By JOHN MOYLE

ONE such question turned up in the mail the other day. It came from a reader who obviously had been poring over some of our articles on speaker housing and vented enclosures. He had been putting two and two together, measuring up his own radio cabinet, and cogitating over the result.

The result, of course, was his question. In effect he wanted to know how he could make his radio cabinet into a vented enclosure, for he had found after working out a few sums that the cubic capacity which would be enclosed by his radio cabinet if it had a back was not much less than that required for an enclosure. He was even prepared to cut a "slot," as he termed it, in the front to act as a vent—an act of supreme sacrifice to my mind, as his set was obviously a good one, housed in an expensive figured cabinet.

My correspondent, who, by now had received my comments, is probably typical of many others in the same boat.

The best reply to a question of this type is to outline once more the requirements for a vented enclosure in simple terms.

First of all, as my correspondent had appreciated, it is nothing more than a box of certain dimensio
having a normal speaker hole in th
front, and, in addition, a vent
appropriate area. Most people toda
realise that the ordinary lou
speaker uses a cone which has
tendency to favor notes which c
incide with its own natural reso
ance. This resonance is determine
by the physical characteristics of th
cone—its mass, suspension, size, an
so on.

AVERAGE RESONANCE

The average speaker is resona
at about 70 cycles or thereabouts-
that is for a 12-inch model.

The idea of the vented enclosure
to regulate its cubical capacity
such a value that its natural resonance corresponds with that of th
loud speaker.

Broadly speaking, the result is th
whereas without proper baffling, th
speaker cone tends to develop ex
cessive movement round about i
natural resonance, this moveme
is largely checked or "damped
when placed in the vent, because
this particular frequency, the a
column inside the vent "loads" th
cone most heavily.

Another way of looking at it is
remember that the cone speaker
really an air pump, which make
the air vibrate when it is fed by th
amplifier or radio set. Our air pum
has a tendency to pump too vigor
ously at 70 cycles per second, an
therefore to produce too much a
disturbance. When we mount it in
box of such dimensions that the a
inside it resists being pumped mo
strenuously at a frequency also abou
70 cycles, we see that the two in
sense cancel out, and the too gre
output of the speaker at that poi
is automatically reduced to a mo
normal figure.

LOADING

There are methods of "loading
the speaker other than the vente
enclosure, of course, but it so happens that this method is extremel
simple, and although it gives be
results when carefully "tuned," as
only to be expected, it will also improve results even when the bo
dimensions are approximately co
rect.

Mathematicians and experimen
ers have written reams to show wh
everything must be dead right fo
best results, and we wouldn't question the general truth of their fin
ings. But we have satisfied ou
selves that even if the vent is doin
an approximate job, it is worthwhil
Only if the dimensions are obvious
too small for the speaker used,
the reproduction likely to suffer

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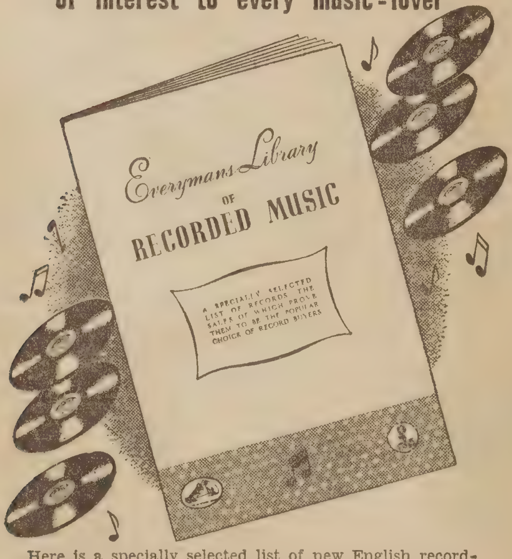
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mpared with that obtained with a at baffle.

Now to tie up these broad prinples with actual practice. Why houldn't the back of a big cabnet be made into a vented enosure?

Well, the first thing to remember that the box itself must be airght. The only outlets should be e speaker hole, and the vent itelf. Have a look at your own cabet, and see how easy it would e to meet this requirement!

I think it will be almost univerlly true that sealing every crack d cranny would be a difficult job, not an impossible one. Most binets would need a bottom fitted well as a back, and many have top board at all, particularly ose in which the receiver is hung om one side of an internal mountg panel, and the gramophone otor hung from the other. In such case I would say that the task sealing up the top of the cabet would be almost impossible.

IGIDITY

There is another important reuirement of the vented enclosure nd that is of absolute rigidity. articularly for a 12in speaker, the ir pressure set up inside the enosure is very high, and solid wood ply at least three-quarters of an ch thick is needed for good reults. How many cabinets could eet this demand?

You will probably find that the des of the cabinet are not nearly s thick as this and the front is robably thinner still. A solid botom and back would be so much aste of time in a case such as this.

The only solution I can see here ould be to make a complete enlosure of the right size and fit into the back of the cabinet so at the speaker cone coincides in osition with the hole already proided in the cabinet. But here gain, how many cabinets could acommodate an enclosure of six or even cubic feet, which is about the inimum needed for a 12in speaker? ery few.

EPARATE ENCLOSURE

It would seem, therefore, that if is expedient must be adopted, ere is everything to be gained by uilding a separate enclosure for he speaker, leaving the cabinet as is.

This conclusion seems to provide he answer to my correspondent, at most radio cabinets are not trong enough or big enough for onversion into an enclosure.

Is there very much we can do, herefore, to improve the radio abinet as a speaker baffle, assumg that the separate enclosure is not esired?

Yes, up to a point, there is. Renembering that the object of a affle is to provide a large path from ack to front of the cone, we could tart by fitting a bottom to the cabet, if there isn't one already. This vill often improve the baffling, and eavy wood should be used. But ve now have to consider the resonnce of the cabinet itself, which will, pronounced, spoil reproduction somewhere about the 100 cycle mark, if it is a big one.

Extra battens placed on the sides and bottom to brace the wood will, in most cases, be a big help. Even in the case of an enclosure, this bracing is valuable. Ideally, any enclosure more than about six cubic feet should be made of wood more than one inch thick, and a job built solidly of brick would be noticeably better, so important is this matter of rigidity.

Rather a good idea which was seen quite often a few years ago consists of padding the inside of the cabinet with some soft material such as cushion filling, held in place by sufficiently strong material, thus converting the back of the cabinet into a shallow, padded horn or flare. This almost completely fills the cabinet space with heavy damping and helps materially to remove resonance from it.

LINING THE CABINET

Even lining the inside of the cabinet with as much celotex or similar material as possible will often be a good thing. But although these expedients can do much to prevent the cabinet from adding undesirable effects to reproduction, they cannot do much to remove the resonance of the speaker itself, increase the efficiency of the speaker, or lower the bass reponse of the system as a whole, all of which the vented enclosure can do.

Once again it is an example of extra trouble being necessary if worthwhile improvements are to be made. In each individual case, you must make up your own mind whether you think it is worth it.

All this doesn't hold out much hope for the man who, at the start of this article, wanted to do something about his cabinet. I think you can see for yourself, however, the reasons why there isn't much future in mutilating what might by a nice piece of furniture in the hope of making it do something it just wasn't designed to accomplish.

Once again, this search for quality —doesn't it drive you nuts?

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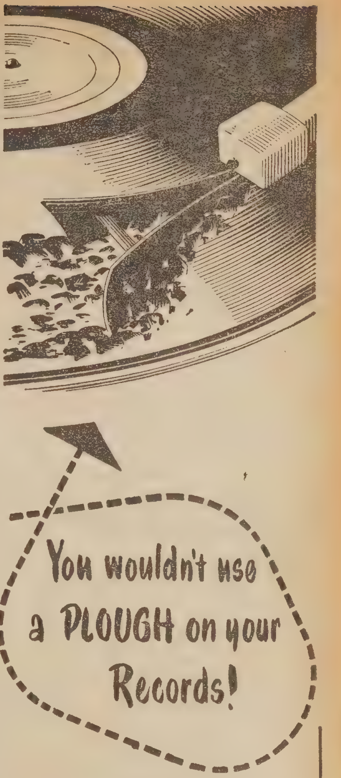

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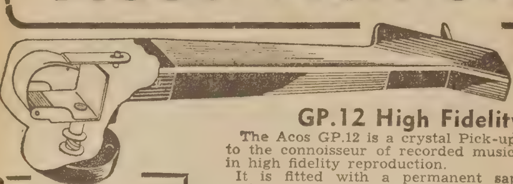

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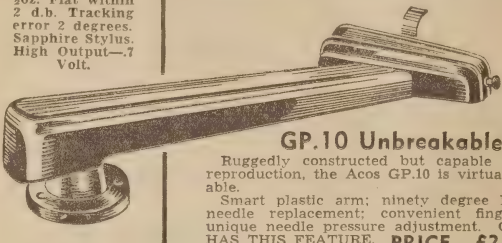

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(Continued from Page 11)

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unaware that his course is bei
reported by the invisible netw
of transmitter buoys, and in
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give him immunity from detect
and pursuit.

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"labels." They were small and bla
and had to be cut from the sh
with a pair of scissors, as pinho
had not then been thought of.
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head upon them. In the case of
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eight of these upon your letter. T
thing is as laughable as it is
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Serviceman Who Tells

(Continued from Page 51)

"After much probing, switching the old multi-meter to every scale it possesses, smoking the last of a packet of 'fags,' it was discovered that the wires of volume control had mysteriously resoldered themselves so that all output was effectively earthed at that point. I was not amused.

PEANUT VALVES

"One other instance which has just come to mind was with a portable receiver of recent design with 'peanut' valves. The owner stated the set was 'dead,' and thought that four of the five valves were blown because only one of them was alight. On viewing the receiver, I noticed a 1T4 glowing like a torch globe. Testing this valve for shorts showed that control grid was touching the plate. No, I didn't replace it with a new one. Taking it out and giving it a smart smack on the palm of my hand made it none the worse for wear. That's the worst of we backyarders; we don't have to depend on radio for a living."

Thanks, Mr. Aslin for your breath of South Australia. We were nearly going to say "your breath of Adelaide," but remembered in time that the two names are not synonymous.

Just by way of conclusion, here is a spot of advice born of long and sometimes bitter experience.

Valves are sometimes hard to get out of their sockets, but one didn't need to worry so much in the "good old days." It was simply a matter of taking a husky grip on the domed portion of the envelope and hauling — always providing that the valve was not searing hot or loose in its base.

GT VALVES

The smaller valves give most of the trouble, and it seems that the more the makers reduce the dimensions, the more difficult it is to get them out of their sockets. Generally, it is a matter of accessibility.

When a "GT" valve is tucked between a number of taller components, it is often impossible to get the fingers down around the envelope. One is tempted then to take a firm grip on the grid cap and haul upwards. Sometimes it has the desired effect, but other times it simply pulls the grid cap adrift. The technique is to rock the valve slightly from side to side and apply just enough upward pull to ease it from the socket.

If it becomes necessary to use too much force, turn the set upside down and push on the locating spigot with a screwdriver. But keep your free hand over the valve or it is likely to shoot out and end its days on the floor.

There is the other technique of slipping the blade of a screwdriver beneath the edge of the base and prising the valve upward that way. Either switch the set off beforehand or make sure that the screwdriver does not get tangled up with the plate, particularly in the case of a rectifier.

Here's Your Answer Tom!

(Continued from Page 63).

the mains run only to the transformer primary and have no connection with the chassis or the remaining circuits.

I am interested in becoming a "ham." Could you tell me the nature of the exam (curse them) I would have to pass?

Now, now, Tom, control yourself! This question is a very easy one to deal with because we handled it only a few weeks ago. In fact, since you wrote the letter some weeks ago, we expect that you have read all about it by now.

But it's no use cursing, my boy, You just have to get your head down and swot.

What is resonance and what is distortion?

More audio? You certainly have the ability to jump from one extreme to the other, but we guess you want to know the answer, otherwise you wouldn't have bothered writing.

Resonance can be mechanical or electrical in character. The piano string we spoke about earlier vibrates of 250 cps because its length, weight and tension are such that 250 cps is its natural resonant frequency. Loudspeakers, pick-ups and other such devices have resonances or frequencies at which all or part of the movement tends to vibrate most readily. At such frequencies the response usually rises and the frequencies are exaggerated.

The best example of electrical resonance occurs in a tuned circuit involving a coil and condenser. Resonance occurs at that frequency where the electrons vibrate back and forth most readily. Your receiver is able to tune to individual stations because the tuning circuits can be set to resonate at frequencies corresponding with the various transmitters.

Distortion is commonly used in audio discussions and it refers to any spurious quality which is added to a signal by a portion of the reproducing system.

If all frequencies are not amplified equally the system is said to suffer from frequency distortion. On the other hand, if the amplifying system adds to or subtracts from the character of the signal, harmonic distortion is said to be present.

It may take forms other than those mentioned, in fact, all forms of distortion generally appear together in lesser or greater degree, depending on the quality of the equipment. One thing is sure, however, in that distortion is undesirable in any form. It robs speech or music of its natural quality and may even make it downright unpleasant!

Perhaps we've said enough on the subject! In fact, Tom, we've said quite enough for any one month, so cheerio until the first Friday in April.

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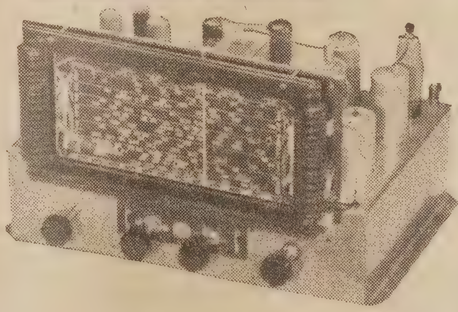

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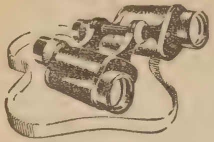

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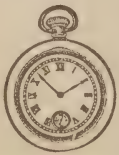

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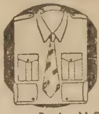

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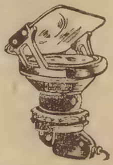

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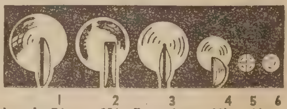

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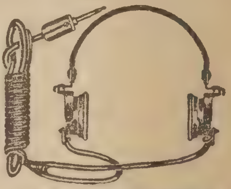

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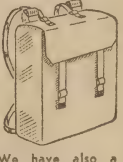

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ANSWERS TO CORRESPONDENTS

E.Q. (Jindabyne, Qld.) advises us of a change of address and asks if we have any future plans of describing a six-valve battery-operated broadcast receiver using a 1J6-G in a B-class output stage.

A. Your change of address has been noted by the subscription department, E.Q., and everything in that direction is under control. We have no set plans at the moment of describing a set of the type mentioned in your letter. However, in the November, 1939, issue of R. & H., a seven-valve battery set, called the Economy Seven was described. This set used a 1G6-G in the B-class output stage although this is readily changeable to the 1J6-G or 19. This set employed two stages of IF amplification but with the high-gain modern IF transformers now available, one stage of IF amplification would be adequate.

J.J.H. (Yalleroi, Qld.) says he is having difficulty in obtaining a replacement for the broadcast oscillator coil in a dual-wave battery set. He asks us to help if we can.

A. There is nothing in your letter which would help us identify the brand of unit which is giving the trouble and without this knowledge we are not in the race to offer any assistance. A large number of dual-wave units have been manufactured from time to time but it is just possible that a sketch might have led to recognition. If the unit is still in current production the manufacturer would probably be able to supply a replacement coil. Failing that, the best we can suggest is that you purchase a standard broadcast oscillator coil, remove the can and base, and improvise a method of mounting which would allow the slug to be adjusted for alignment purposes. It would not matter much if this had to be only a very temporary measure, since the slug could always be sealed into position with wax once the correct inductance was established. Some special effort along these lines would be warranted, as it might otherwise mean the installation of a new and different unit with all it entails in terms of wiring, &c.

D.T. (Guyra, NSW) is interested in the "1K5 Four" receiver and wants to know whether it would be suitable for use on a motor cycle.

A. Frankly we have never taken very seriously the subject of motor cycle radio but the problems would be somewhat similar to those which apply in a car. The receiver would have to withstand a suitable variation in operating voltage, a high degree of vibration, and yet give sufficient volume to be heard above road and vehicle noise. This latter problem would not be serious, of course, with an earphone, but we are not sure how you would stand in this connection with traffic regulations. Although 1K5-G valves are very robust, as battery valves go, we doubt whether they could be relied upon under conditions of high voltage and vibration. The circuit itself would not be suitable since it would be essential to employ a sensitive superhet with an efficient AVC system. Small valves also would be desirable to allow the set to be compact. Frankly, we can advise nothing else better than the "Karset." We have not yet tackled the design of a 32-volt vibrator supply although we have it in mind for future reference.

I.B. (Waverley, NSW) sends in a suggestion for the Reader Built It page of Radio and Hobbies.

Thank you very much for the suggestion, I.B., we have filed it for possible future inclusion in the magazine.

H.M. (Christchurch, NZ) sends in a circuit for comment. The set is a five-valve portable with an untuned converter stage and a loop aerial. He claims that the set gives excellent results.

Thank you very much for the circuit, H.M., We may be able to use it for the A Reader Built It section or the Junior Experimenter page at some later date. However, there are a couple of points on which you do not seem to be very clear. With such high gain it is almost essential to decouple the IF amplifier and or the converter from the AVC line. However, you have not actually decoupled it but merely reduced the "Q" factor of the transformer and thereby the gain of the stage by including an unbypassed resistor in series with the grid winding. To achieve true decoupling it is necessary to connect a .05 mfd condenser from the junction of the resistor and the transformer to earth. This will allow the full gain of the stage to be achieved and yet will allow complete stability.

The other point is the use of the potentiometer in the grid circuit of the output valve. In a circuit like yours this is not the best position for the control as strong signals can easily overload the grid of the 1S5 causing distortion while the volume may be turned quite low. The setting of the volume control in no way affects the current drain of a class A amplifier or output valve. This current drain is determined entirely by the plate and screen voltages and the grid bias, not by the strength of the signal input. We would, therefore, suggest that you transfer the control to the voltage amplifier circuit where it will eliminate the chance of overload due to strong signals. Thank you very much for the kind remarks and we are pleased to hear that you enjoy reading our magazine so much.

YOUR QUERY?

1. Queries will be answered in rotation through the columns of our magazine if not accompanied by a fee for a postal reply.
2. Queries, neatly and concisely set out, will be answered by mail as quickly as possible if accompanied by 1/- in postal notes or postage stamps. Endorse envelope "Query."
3. Back numbers are rarely available but reprints of most circuits, wiring diagrams, and parts lists will be supplied for 6d each, minimum charge 1/-. Thus a circuit, layout, and parts list will cost 1/6 in stamps or a postal note. Endorse envelope "Circuit."
4. Blueprints of exact size chassis layouts with all essential holes and cutouts will be supplied, if available, for 2/6. Endorse envelope "Blueprint."

Address your letters to the Technical Editor, Radio & Hobbies, Box 2728C, GPO, Sydney.

SPECIAL NOTE:—

In an admirable thirst for knowledge, some of our readers have been submitting letters which read more like a technical quiz session than legitimate queries! We do want to help you, but there is a definite limit of time which can be set aside for answers. Some conscience-stricken readers have enclosed up to 5/- with their letters, but much as we appreciate the thought, the fact is that if we spend all our time answering involved questions, we will have no time left for the magazine.

Help us, therefore, by restricting your queries to troubles you are having in your contructional work, by asking not more than two or three at a time, and by avoiding general theoretical questions which it is not the function of the Query Service to answer.

—THE EDITOR

W.B. (Kirribilli, NSW), having seen the multimeter circuits published in a recent issue in the Reader Built It page was prompted to send along the details of an AC voltmeter he has constructed entirely from disposals parts and which used standard tolerance resistors.

Thank you very much for the circuit, W.B., we have filed it for possible future inclusion in the A Reader Built It page. Thank you, also, for the nice remarks about R. & H. and we are pleased that you have had such success with the R. & H. set you have built.

J.K.R. (West Coberg, Victoria) sends in a circuit for comment through the Junior Experimenter page.

Thanks very much for the circuit, J.K.R. We will deal with it at the first available opportunity.

R.R. (Sunshine, Victoria) sends in a question for the Answer Tom page of Radio and Hobbies.

Thanks for the question, R.R., we will deal with it at the first available opportunity.

I.M. (Casterton, V) sends in an advertisement for the "Wanted To Buy" columns and suggests a couple of topics for the beginner's articles.

A.: Your ad. has been handled in the normal way and the receipt despatched forthwith. Many thanks for the suggestions, which we will keep in mind for future reference.

A.H. (Dimbulah, Qld.) is another reader interested in 32-valve receivers and he makes the point that theoretically a 16-cell battery can rise to 44.5 volts fully charged and with high density electrolyte. He says that the protection of valve heaters presents quite a problem and he prefers a genemotor for the high-tension supply, on the assumption that it is less prone to overload troubles.

A.: Many thanks for your remarks which were read with considerable interest. While we appreciate the figure you quote, it is fortunate that few systems appear to reach a peak voltage as high as this, most of them being under 40. We cannot help you with materials for the X-ray plant, and, apart from anything else, the subject is right outside our normal scope of activities. We suggest that you be careful in your handling of this gear as you might inadvertently do damage to yourself and other people around the place. However, your apparent familiarity with such matters may render the foregoing remarks completely unnecessary.

H.M.W. (Auckland, NZ) writes in appreciation of Radio and Hobbies and in particular of articles by "The Serviceman Who Tells." He says that NZ readers envy us for the variety of components available on the local market, especially ex-disposals, but says that NZ readers "have the wood" on us in the price of valves.

A.: We read your remarks with interest, H.M.W., and were much amused by the anecdote from your service experience. Regarding the Williamson amplifier, we have published a good deal but the complete amplifier and tuner set-up did not originate with Radio and Hobbies. For full information you would have to write to the advertiser concerned.

K.J.McN. (Ayr, Qld.) says he finds a good deal of interest in Radio and Hobbies and is particularly interested in the design of 32-volt receivers. He says that his own installation is a 500-watt wind-driven system and that, with a fresh freeze, the voltage rise to 38 at a charging current of 21 amps.

A.: You certainly must have some "fresh" breezes to spin the charger enough to produce the figures you quoted. We would say that 38 voltage is not enough to cause trouble in the average installation, but we are not so happy about installations where the maximum voltage gets well into the 40. By this time you should already have seen our first suggested design.

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We specialise in Radio parts and stock all reliable brands. We can supply: Coils, I.Fs., Transformers, Resistors, Tubular Condensers, Valves, Wires, Flex, Meters, Testing Equipment, Radio Manuals, Irons, Toasters, Pressure Cookers, Jiff Toasting Irons, Trimmers, Padders, Gang Condensers, Cabinets, Motor and Pickups, Record Changers, Solder Irons, Solder and Electrical Accessories, 4 and 5 Valve Mantel Sets—Portable Sets, Console Radios and Radiograms, etc.

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Unboxed IT4 valves .. .. 12/- each
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J.L. (Longueville, NSW) makes the surprising charge of plagiarism against "The Serviceman Who Tells." He says that the serviceman described and treated a number of failures which, by sheer coincidence, were identical with those he had himself experienced in the previous month.

A.: You certainly had us in, J.L., over the first portion of your letter, for the "Serviceman" is original, if nothing else. However, our own reactions were nothing to be compared wtih his face when we handed the letter to him with an appropriate expression. After that, he broke down and had a good laugh.

H.E. (of Rockhampton, Qld.) says he has been looking for a circuit of a pre-amplifier which can be connected to a set having only aerial and earth terminals.

A.: We are not at all clear about your requirements and, in point of fact, a pre-amplifier may be completely unnecessary. If you wish to use a pickup, the chances are that it could be connected into the circuit at a suitable point without further ado. The fact that a receiver has no pickup terminals does not necessarily mean that it cannot be used with one. The main point would be to see that you purchase a pickup with a fairly high output voltage. On the other hand, you may have in mind to operate a microphone with the set, in which case, a pre-amplifier may be necessary—that is, of course, unless you are content with a simple carbon microphone and transformer. Such is the general position. We could not possibly hope to supply a circuit or go into greater detail without having some idea of the receiver circuit itself.

H.N.A. (of Toorak, Vic.) renews his subscription to Radio and Hobbies and tells of the success of a record player outfit built around the 20-watt 807 amplifier.

A.: Many thanks for your letter and your remarks about the amplifier set-up were read with interest. We have no doubt that it does indeed sound very fine since the equipment would be capable of making good use of the most important frequencies up to about 7 Kc. The response of your pickup and speaker would both drop off sharply above this region but a falling characteristic of this nature fits in well with the characteristics of most recordings. Some of the later gear we have been using is substantially flat up to 15 Kc. but its full value can only be realised on occasions. Most times, we are content to play it with the top deliberately cut off at about 8.5 Kc. Your offer to assist other record enthusiasts in your district may well be taken up by more than you bargain for, but we must commend you for your practical interest in fellow-readers.—(H. N. Anderson, Flat 7, "Moonbria," 68 Mathews Road, Toorak, Melbourne, SE2.)

L.J. (of Auckland, New Zealand) forwards his subscription to Radio and Hobbies and says he has been an enthusiastic reader from the very first issue. He is particularly interested in tape recorders and commends to any prospective constructor an article in the February 1948 issue of our American contemporary, Radio News.

A.: We are glad to note your appreciation of Radio and Hobbies but cannot promise to publish too many highly technical articles on radar, navigation aids, &c. While many of these have good news value, only a very limited number of readers are interested in the technicalities, and such articles are not particularly popular. We read with interest your remarks about wire and tape recorders and are inclined to agree that the latter are the better proposition for anyone who plans to build one up. We do not think that you have much chance of receiving Australian television programmes, if and when these eventuate. It is true that break-throughs occur in summer months on the 50 Mc. amateur band, but the likelihood of this occurring at still higher frequencies seems remote. There has been plenty of activity on 144 Mc., but nothing spectacular has happened as yet and it would appear that nothing short of freak conditions would be necessary to allow Australian 144 Mc. transmissions to be heard in New Zealand. With television programmes radiated on a still higher frequency, the chances appear extremely remote.

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INTRODUCTION TO VHF AERIALS

(Continued from Page 89)

for yourself by connecting the array to a transmitter, and exploring the field of the aerial with a dipole into the centre of which is connected a low consumption pea lamp. The effect of adding and subtracting elements makes rather a fascinating experiment, and will clearly demonstrate the non-critical effect of the spacing, &c., round the quarter-wave point.

Incidently, try the effect of two reflectors spaced a half-wave length above and below the driven element. You will be surprised the effect they have on aerial gain and directivity. Such an aerial might well approach the performance of the 6 element beam, and is rather simpler to construct.

In all the examples given here we have tried to rationalise all measurements to give you a starting point which should ensure good results. If you are very particular, slight improvements might be made by pruning, &c., for which greater knowledge and a fool-proof set-up are essential if you are to get very far.

AN excellent penetrating oil for loosening rusted and corroded nuts and bolts can be made by mixing approximately equal parts of paraffin oil and methyl salicylate (oil of winter green), to which a little ordinary lubricating oil—or, better still, coloidal graphite—has been added.

This penetrating liquid will loosen the tightest of nuts, but it takes time to do so, usually about five minutes to 20 minutes. There is no penetrating oil or other substance which is capable of loosening rusted-up nuts instantly. In all cases it is very necessary to give the liquid time to seep down into the finest crevices.

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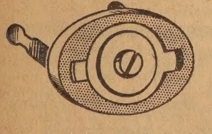

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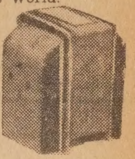

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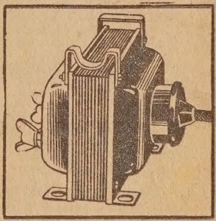
The Scope soldering iron is ideally suited for use in factories, laboratories and for work normally met by servicemen. It is 10" long and weighs only 3¼ ozs. It is supplied with or without the transformer and is also equipped with a special holding bracket for the iron when it is not in use.



The transformer illustrated is designed to supply 4.3 volts from A.C. mains for the Scope soldering iron. It is available at extra cost on request and may be used for continuous operation. Price, 30/6.

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A smaller edition of the iron illustrated is available for precision work. The specifications are exactly the same, except that the iron is smaller, shorter and lighter. It is extremely suitable for delicate instrument work.

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FOR SALE: Eddystone 640 Receiver, brand new condition, with 9" speaker and metal box, £55/10/-. **C. W. Everdell, Gleneagle, Beaudesert Line, Qld.**

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FOR SALE: 1 Palec valve and circuit tester (Model VCT-V), excellent order. Bargain £25. Apply **W. Sleaford, William Street, Rosewood, Qld.**

Readers wishing to buy, sell or exchange goods are invited to insert an advertisement on this page. The cost is 1/6 per line; approximately 5 words to a line. Advertisements for the next issue must reach our office by WEDNESDAY, NOON, March 8, 1950. Dealers' Advertisements not accepted.

FOR SALE or Exchange: Approx. 100 trans. crystals, from channels 1 to 90. Any good offer. **V. Sotheren, 6 Haig Avenue, Ryde, N.S.W.**

SALE: American design 100W phone-CW transmitter. Enclosed in two crackle finish steel cabinets 12.19.10 inches each. One contains RF and plate modulator; other, three complete power supplies. Ready to go with two crystals, coils for 7, 14, 28 megacycles, mike, all tubes, and complete instructions for £100. Vacuum tube voltmeter, commercial manufacture with RF probe, £50. **38 Anglo Street, Chatswood, N.S.W. JA6764.**

SALE: Quantity radio, elect. magazines, books, parts, valves. To clear. Offers? **Rooke, Tiree, Eustace St., Manly. XU2056.**

SELL: Williamson amplifier, AWA spec., 550 volts, choke input, fully balanced, £25. **Mote, 224 Church Street, Parramatta. UW7522.**

SELL: Kriesler dual-wave AC brown bakelite case, perfect, £10. **Flat 5, 42 McDougall St., Milson's Point, Sydney. XB3400.**

SELL: Magnavox type 512 Dynamic Speaker, 12" Curvilinear Cone. 25000 ohm field. Nearly new. Cost £19, will sell £15 or near offer, or will exchange for A.C.-D.C. or Portable Receiver using late types of Valves, or a camera of good make, preferably Reflex. **R. St. Clair, 97 Alexandra Parade, Collingwood, Melbourne, Victoria.**

SELL: First ten vols. R & H. Complete less two issues. Also nine spare copies. Offer. **J. Croft, 17 Berry St., North Sydney.**

SELL: One set of Radio Lessons in perfect order, £10, or near offer. **A. R. Waldron, High Street, Casino.**

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SELL: "Aegis" KC4, 11 valve, Commu cations Rcvr., 540 Mc to 30 Mcs., c stal, BFO, Bandspred, new, £50; also 348, FCA, original condition, convert AC 240. Perfect condition, £30. Sell gether or separately at above pric **Elliott, c/o Repat. Sanatorium, Kenmo Brisbane.**

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